Schuylkill River Development Corporation

Conceptual Design Services for
Grays Ferry Pedestrian Bridge, Philadelphia, PA
Project No. GFP-1

Concept Studies Report

Grays Ferry Pedestrian Bridge
over
The Schuylkill River

PREPARED BY:

AMMANN & WHITNEY

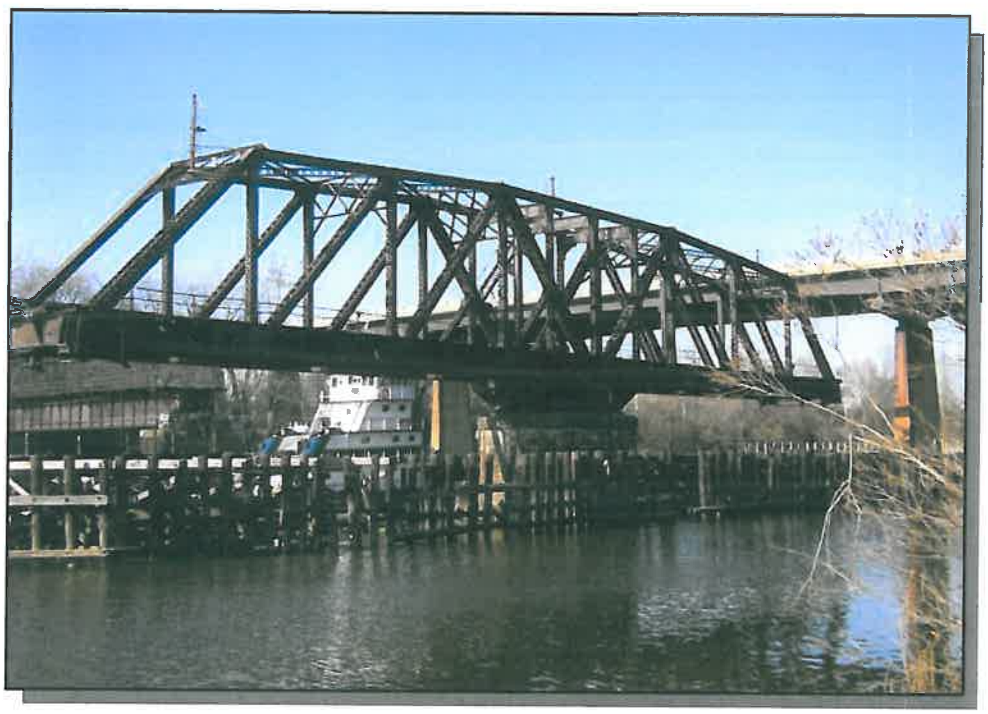
February 2012

Schuylkill River Development Corporation

schuylkill banks

Conceptual Design Services for
Grays Ferry Pedestrian Bridge, Philadelphia, PA
Project No. GFP-1

Concept Studies Report



Grays Ferry Pedestrian Bridge
over
The Schuylkill River

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOSEPH SULLIVAN
ENGINEER
NO. 50144-E

Joseph Sullivan, PE

PREPARED BY:

AMMANN & WHITNEY

February 2012

TABLE OF CONTENTS

I. INTRODUCTION **1**

II. EXISTING STRUCTURE **2**

III. RIGHT OF WAY & EXISTING PROPERTIES WITHIN THE PROJECT SITE **3**

IV. PERMITS **4**

V. VERTICAL CLEARANCE REQUIREMENTS **6**

VI. VERTICAL PROFILE & HORIZONTAL ALIGNMENT **8**

VII. PROPOSED CONCEPTS **8**

- Truss Concept 1 9
- Truss Concept 2 9
- Truss Concept 3 10
- Cable-Stay Concept 1 10
- Cable-Stay Concept 2 11
- Cable-Stay Concept 3 11

VIII. COST ESTIMATES **12**

IX. PUBLIC INVOLVEMENT **13**

X. RECOMMENDATION **14**

XI. ACKNOWLEDGEMENTS **15**

APPENDIX A: Existing Plans
APPENDIX B: Conceptual Plans
APPENDIX C: Quantity and Estimate Calculations
APPENDIX D: Roadway Plans
APPENDIX E: Project Site Photographs
APPENDIX F: Public Involvement
APPENDIX G: Inspection Report

I. Introduction

A conceptual design study has been performed for a proposed pedestrian bridge adjacent to the existing Grays Ferry Avenue highway bridge over the Schuylkill River. The proposed bridge, which is in the location of the abandoned Conrail swing bridge, will serve as a key connection in the Schuylkill Banks trail. The Schuylkill Banks trail stretches between the Art Museum and Locust Street, and there are several sections under design south of Locust Street. The ultimate goal of the Schuylkill River Development Corporation (SRDC) is for the trail to continue down the east bank of the river to Grays Ferry and then cross over to the west bank to enable a connection to Historic Bartram's Garden and ultimately to Fort Mifflin. This crossing is envisioned near the south end of the DuPont Crescent in the vicinity of Grays Ferry Avenue. The DuPont Crescent is a recently enhanced trail area that follows along the Schuylkill banks from 34th Street down to Grays Ferry Avenue (See Figure 1 below).

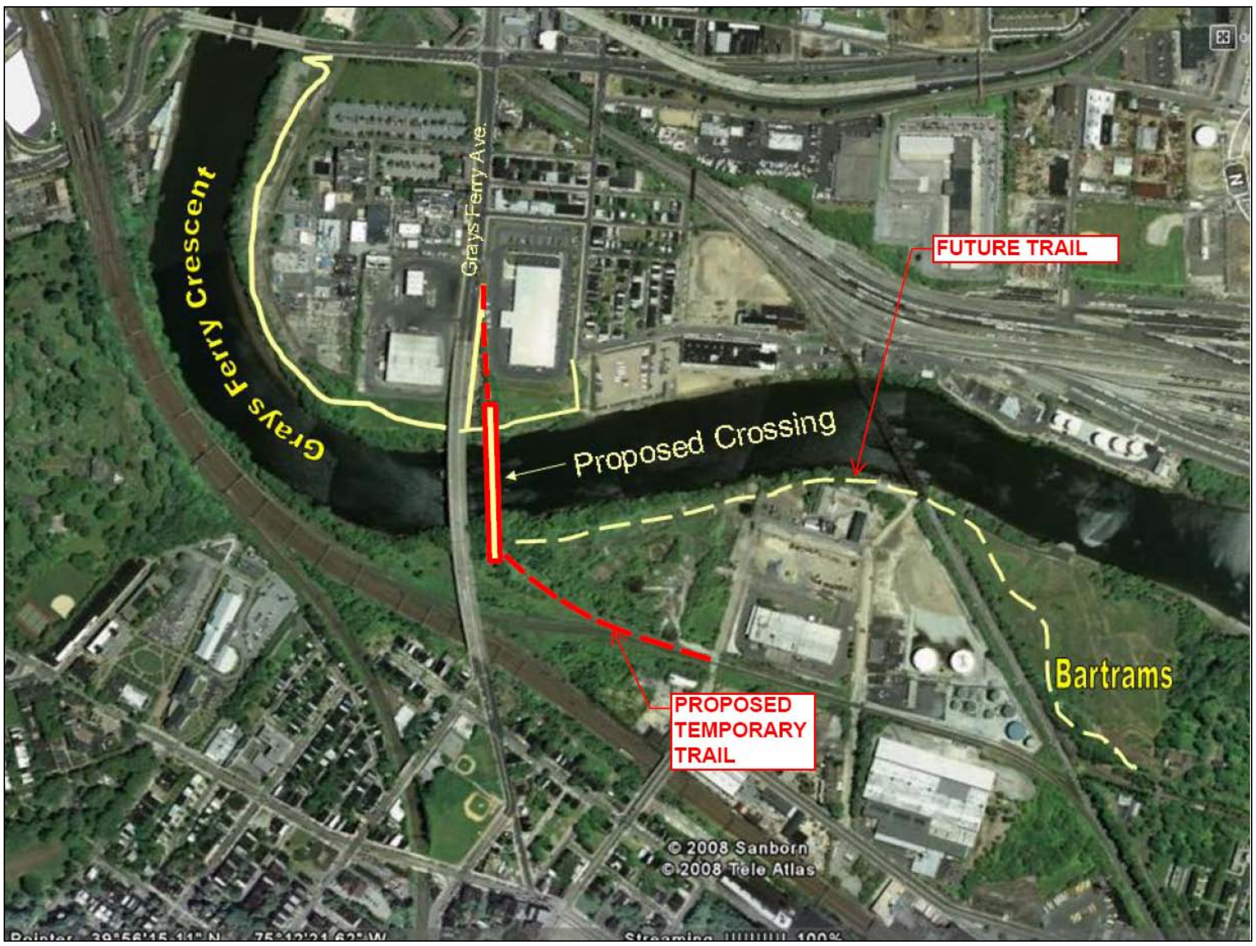


Figure 1: Project Location Map

This report presents the conceptual study done for providing a new pedestrian and bicycle facility to cross the river at the existing Conrail Bridge location. Six different structural concepts are presented as a means of traversing the river. Some concepts involve reusing the existing abandoned Conrail Bridge in conjunction with portions of new structure, while others involve completely new structures passing over the existing truss that would possibly be rehabilitated and serve as a historic “relic” of the past. Advantages and disadvantages of each concept are provided. The report concludes with a preliminary cost estimate for each concept.

II. Existing Structure

The existing structure, which was built in 1901, consists of four spans over the Schuylkill River. Each 97’-9 3/8” approach span is made-up of two 8’-6” deep steel plate girders. The existing 226’-3” long swing steel truss is currently supported in the open position at mid-span with two equal cantilever spans. The bridge carried one non-electrified freight line. The truss is permanently in open position since the structure and rail line were abandoned by its owners. It is very likely that the mechanical systems do not function anymore. Additional information may be found in the existing plans (See Appendix A).

An in-depth inspection was conducted between June 21 and June 23, 2011, and determined that the overall condition of the bridge was fair to poor. The structural integrity of the superstructure has not been compromised; however, the extent of steel repairs needed to extend the life of the structure will be costly. The superstructure steel had many areas of severe deterioration below the deck rails, particularly in bottom chords, gusset plates, and lateral bracing. The substructure stone abutments and piers had minimal areas of concern. The concrete retaining wall at the north end of the East Approach had several areas of deteriorated and spalled concrete. The paint system has failed throughout the entire superstructure with moderate to severe surface rust typical.

Based on engineering judgment and the fact that the original purpose of this bridge was to carry the Cooper E80 train live load, the existing structure with appropriate repairs should have more than sufficient capacity to carry pedestrian loads. Once the preferred concept has been identified a detailed analysis on existing structures that will be reused will be carried out and necessary repair details will be developed.

AWK Engineers provided survey information in the river bed in order to determine if there is any concern for scour and undermining of the substructure foundations. A section of the river bed created from the survey is shown on the General Plan and Elevation (See Appendix B). Further investigation of the existing substructure, consisting of underwater inspection, will take place in post conceptual design phases.

III. Right of Way & Existing Properties within the Project Site

Field survey of the project area was performed by AWK in November, 2009. Vertical control was in accordance with NAVD 1988. Digital Terrain Model (DTM) for the survey has been produced and is reflected in all of the conceptual General Plans. A property owner mosaic has also been created on the project base plan shown in the General Plans for each of the concepts.

As shown on the plans in Appendix B, the existing truss lies in the ownership right-of-way of Conrail Shared Assets. The width of required right-of-way in the trail areas for the trail and greenway is 60 feet wide. The width of required right-of-way in the area of the bridge is increased to an 80 foot width in order to accommodate substructures and embankment areas. There is a 100 ft x 100 ft temporary construction easement required on the west bank for construction staging or crane operation. There is also a 50 ft x 250 ft temporary construction easement potentially required if the contractor chooses to rehabilitate the truss on land. Required right-of-way and temporary easement lines are shown in the roadway plans located in Appendix D. The following table summarizes the approximate acreage of required permanent and temporary land acquisition based on the current alignment.

REQUIRED RIGHT-OF-WAY

Owner (Property Mosaic)	SF of Required R.O.W.	Acres of Required R.O.W.
PHILADELPHIA AUTHORITY FOR INDUSTRIAL DEVELOPMENT EXHIBIT A-1 INSTR 51609928	929	**0.0213**
PARCEL NUMBER THREE D-1081-431	3031	**0.0696**
NEW YORK CENTRAL LINES LLC PURPORTED TO BE OWNED BY CSX TRANSPORTATION, INC.	88818	**2.0390**
REDEVELOPMENT AUTHORITY OF THE CITY OF PHILADELPHIA	31904	**0.7324**
AERO PHIL FE, LLC	14526	**0.3335**

TEMPORARY CONSTRUCTION EASEMENTS

Owner (Property Mosaic)	SF of Required R.O.W.	Acres of Required R.O.W.
NEW YORK CENTRAL LINES LLC PURPORTED TO BE OWNED BY CSX TRANSPORTATION, INC.	16090	**0.3694**

From station 0+00 to station 6+00, the required right-of-way cannot be obtained due to overlap with existing CSX railroad tracks and drainage ditch. Either a smaller trail and right-of-way footprint or refined alignments to gain access to Bartram's Gardens can be investigated during property acquisition phase of the project.

IV. Permits

Potential permits needed for the Grays Ferry Bridge over the Schuylkill River project include: a DEP Joint Application Form which covers the Pennsylvania Water Obstruction and Encroachment Permit and the U.S. Army Corps Section 404 Permit; a letter to DEP for Coastal Zone Management Consistency as the project lies within Pennsylvania's Delaware Estuary Coastal Zone; and a US Coast Guard Bridge Permit for navigable waters. A general NPDES permit will also be necessary if more than 1 acre of disturbance will occur during project construction. If less than 1 acre of disturbance occurs, the NPDES permit is not required. An E&S Plan Review will still be required even if a NPDES permit is not. A Conditional Letter of Map Revision (CLOMAR) will be required for FEMA if there is any change in elevation to the floodplain by the proposed project.

All permits should be pulled together concurrently with the design phase of the proposed project. Permits should be submitted in the semi-Final/Final Design Phase. Insignificant changes made to the plans after submission of the permits can be submitted in a modification package.

DEP Joint Application Form

The DEP Joint Application Form is for the Pennsylvania Chapter 105 and 106 Water Obstruction and Encroachment and Permit and U.S. Army Corps of Engineers Section 404 Permit. The DEP has state and federal authorization for the proposed project unless it is determined that the application does not fall under dual review by the DEP it will be forwarded to the Corps for federal review. The permit requires the completion of an Environmental Assessment Form, General Information Form (GIF), hydrologic and hydraulic analysis, E&S control plan and approval letter, the determination of historic/archaeological site presence from PHMC, completed and approved Pennsylvania Natural Diversity Inventory Form and site plans including cross sections and profiles. A Pre-Application Conference is recommended but is not required for the application process. Once the application is submitted, it is expected to take 6 – 9 months for review.

Army Corps of Engineers Permit

The Army Corps of Engineers Permit informs the Corps what the proposed project entails. General information is needed to fill out this form such as the location and purpose of the project as well as if fill material is to be discharged. This permit must be sent in separately from the DEP Joint Permit because this project involves the Schuylkill River. Review of this permit is expected to take between 30 and 90 days.

Nationwide Permit No. 15 U.S. Coast Guard Approved Bridges may also be required from the Corps in order to regulate fill in the waters as a result of the proposed project. Nationwide permits are issued for projects with minimal impacts with as little delay or paperwork as possible.

US Coast Guard Bridge Application Permit

The Schuylkill River is a navigable waterway; therefore a Bridge Permit Application with the US Coast Guard is required. Information needed to complete this permit includes: the primary authority for the construction of the bridge and under what legislative authority the bridge is being built, proposed clearances and elevations, owner and type of existing bridge structure at the site, construction activity, and environmental effects. State and local authorizations are also required, as well as information about fill, if applicable. Adjacent property owners within a half mile radius are also needed. The estimated cost of the project and estimated total value of yearly commercial shipping on the waterway affected by the bridge is also required. Lastly, drawings of the proposed project must be submitted in the application. The Coast Guard also requires navigational lights on bridges that cross waterways, temporary lights during construction and permanent lighting post-construction.

It should be expected to require about 3 months to pull the application together and another 6 – 9 months for the Coast Guard to review the application. At least one Pre-Application Conference will be needed; one before the application is submitted and possibly one during application review. One meeting can be held with all of the regulating agencies together instead of multiple separate meetings.

NPDES Permit

A general NPDES permit will be required if more than 1 acre of disturbance will result from the proposed project. Information needed for the permit includes general project information (description, location, and existing land use), fill materials, total disturbed area, and estimation timeframe for project completion. E & S Plans must also be submitted in the application even if less than 1 acre will be disturbed. The design team should also note that a post-construction storm water management plan will also need to be developed. It should be expected to take 30 – 90 days for the application review.

Coastal Zone Management Consistency

The letter to DEP for Coastal Zone Management Consistency is necessary because the project lies within Pennsylvania’s Delaware Estuary Coastal Zone. This letter should include general information about the proposed project. DEP will review the letter and decide if the project meets the coastal zone requirements. Response time from DEP for this letter is expected to be between 30 and 90 days.

CLOMAR

A Conditional Letter of Map Revision may be required for FEMA if there is any elevation change to the floodplain by the proposed project. The letter will indicate if the project, if built as proposed, will be recognized by FEMA. Once a project has been completed, the community

must request a revision to the Flood Insurance Rate Map (FIRM) to reflect the project. Approval from FEMA may take up to one year so it is highly recommended to avoid changing floodplain elevation.

Mitigation
The regulating agencies require that permitted activities resulting in impacts to the project area require mitigation. It is not anticipated that this project will require any mitigation as impacts will be minimal.

NOTE: If this project is state or federally funded, an environmental document will need to be prepared.

V. Vertical Clearance Requirements

The adjacent Grays Ferry Avenue Bridge has a 50 foot vertical clearance. In addition, the I-76 Bridge also has a 50 foot vertical clearance. These are the two fixed span structures between the project site and the remaining industrial site upstream, Trigen Energy. The upstream University Avenue structure is a lift bridge. It was anticipated that due to limited amount of navigable traffic, the vertical clearance may be able to be reduced for this section of the Schuylkill River. Therefore, a 35 foot clearance was evaluated.

A 35 foot vertical clearance is preferable for pedestrians and bicyclists since it would provide a less strenuous, shorter travel time and more direct crossing over the river. A lower vertical clearance was also preferable to the owner since it would limit costs. A 35 foot clearance option would produce a more aesthetically pleasing structure for any concept, particularly those that reused the existing truss.

Initial contact with US Coast Guard representative, Terry Knowles, was made in August 2009 to discuss permitting. Due to the proposed structure's location over a navigable water way, the US Coast Guard permit will be required. However, the permitting process will become more lengthy and involved if we were to propose a vertical clearance that is less than the existing adjacent Grays Ferry Avenue Bridge's. According to the National Oceanic and Atmospheric Administration (NOAA) nautical charts, the Grays Ferry Avenue Bridge provides a 50 foot vertical clearance (See Figure 2 below).

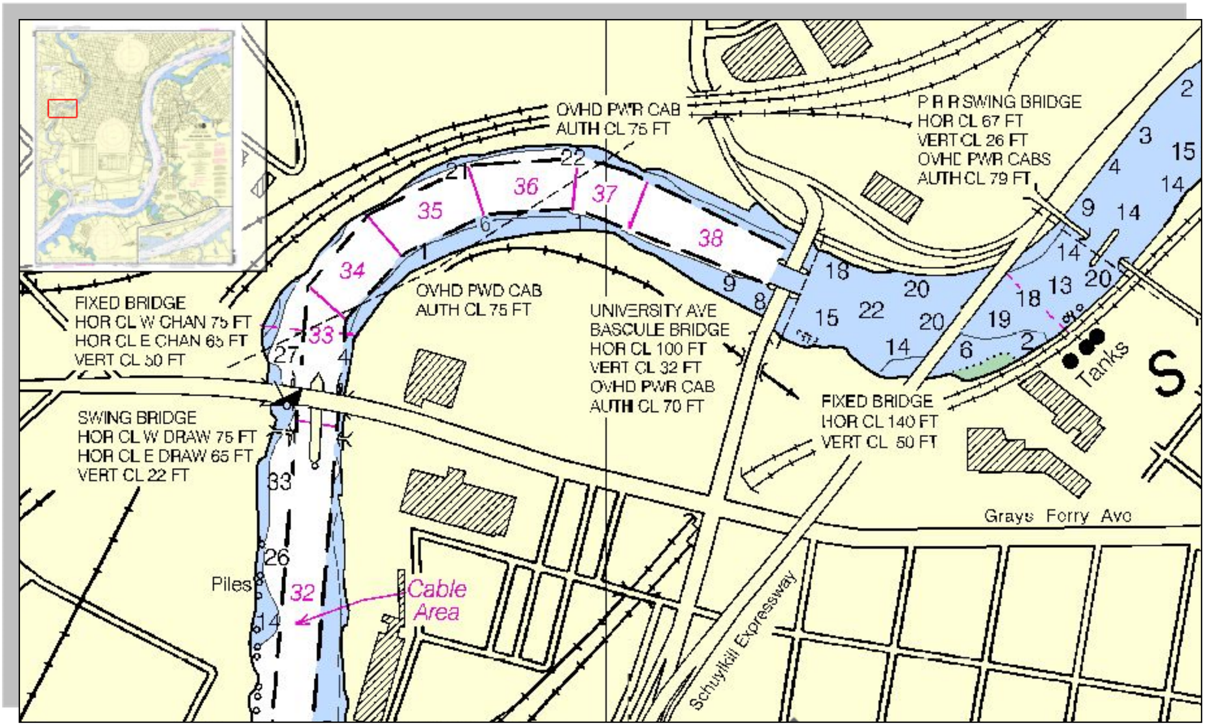


Figure 2: NOAA Nautical Chart in the Vicinity of Grays Ferry Avenue

Further investigation was done in order to determine if the 50 foot clearance definitely had to be met based on the operations and current demands on the river in the vicinity of the bridge. We verified there is only one operation that would be affected by vertical clearances for the proposed structure, which is an oil shipment to Trigen Energy. The Trigen Energy facility is located about one mile north on the river from the project site (See Figure 1).

We established contact with Trigen Energy through Pat Davin. Pat informed us that the oil shipped to Trigen is used to supply steam power to the downtown Philadelphia area, including many of the large hospitals. Frequency of the oil shipments varies from about 12 to 30 times a year and will definitely be a consistent power source in the future. Pat also stated that the PECO facility, which is located adjacent to the Trigen facility, operates strictly from the oil that comes from Trigen.

We attempted coordination of our initial concepts with Vane Brothers Towing, which is the company responsible for towing the barges of oil to the Trigen facility. According to a Vane Brothers representative, they have two different boats available for the operation. One boat requires a 40 foot clearance and the other a 49 foot clearance. Vane Brothers stated that they cannot be limited to using just one of the boats. Therefore, the required minimum vertical clearance based on the current boat traffic will be set at 50 feet.

The existing vertical clearance between mean high water and truss bottom chord is 16.77 feet. In order to reuse the truss in the open position, it would have to be raised 33.23 feet above its current location.

VI. Vertical Profile & Horizontal Alignment

The vertical profile in the area of the bridge was set to maintain a 50 foot minimum vertical clearance above mean high water in the navigable channel. The profile design criteria were based on FHWA publication for *Designing Sidewalks and Trails for Access*. The FHWA outdoor facility guidance allows a 1:12 slope to be used for up to 200 feet without landings. Therefore, the profile was set to a 1:12 slope from the existing piers to the proposed abutments. The resting interval at the abutment shall be 5 foot minimum in length with a slope no greater than 2.0% based on FHWA requirements. From the abutment landing the profile is sloped at 1:12 until it ties into existing ground elevation. From the existing ground tie-in, the profile will match existing ground terrain with a slope no greater than 1:20.

The proposed horizontal alignment was primarily determined by existing features. The alignment begins at the southeast end of the project site at the tie-in to 49th street. From there the alignment follows the path of an existing gravel drive. The alignment deviates from tangent between station 1+50 and station 3+00 in order to avoid an abandoned building. The alignment continues along the existing gravel drive from station 3+00 to station 11+00. The alignment then shifts to follow the existing abandoned railroad alignment. The alignment continues along this path over the Schuylkill River to the east bank, where a tie-in to the Dupont Crescent will occur near Grays Ferry Avenue.

VII. Proposed Concepts

The refining of the proposed concepts has been a dynamic process between the engineers, architects and owner. There were initial concepts created by Agoos/Lovera Architects assuming a 35 foot vertical clearance. Once the required vertical clearance of 50 feet was verified, some of the original concepts were eliminated. With the elimination of initial concepts, new concepts were added for a final number of six different concepts proposed at the end of the conceptual design phase. Two of the proposed concepts incorporate reuse of the existing truss in conjunction with either a prefabricated truss or a cable-stay structure. The other four concepts entail leaving the existing truss in place and constructing completely new structures that pass over the existing truss. Two of the four concepts that pass over the existing truss consist of prefabricated trusses and the other two consist of cable-stay structures.

There are some elements that are consistent for all six concepts. All concepts assume a proposed concrete stub abutment supported on steel piles. Embankment would have to be provided at each abutment location. All concepts assume a proposed fender system. However, the required size of the fender system varies among concepts. Every concept will also include a pedestrian railing and bridge lighting. Very cursory design calculations have been done for some elements of the

concepts just for cost purposes. Therefore, member dimensions, sizes or shapes shown will be refined in future design stages.

The following will give a brief description of each concept that is being considered for the next stage of design, along with advantages and disadvantages. Refer to General Plan and Elevations of each concept located in Appendix B for visual representation.

Truss Concept 1

This concept consists of a prefabricated Contech “link” style truss system. The proposed truss passes over the existing truss with a support through the truss at the existing center pier. The trusses are also supported at the existing east and west pier locations and at new abutment locations. Piers are assumed to be made of reinforced concrete for cost estimate purposes only. The two center spans are 113’-1 ½” and the two approach spans are 140’-0”. Approximate required truss depth, based on span configuration, is 14’-0”.

Advantages of this concept are:

- Prefabricated truss elements provide quick installation and reduced site preparation time
- Minimal maintenance
- Relatively low cost

Disadvantages of this concept are:

- Construction of new center pier may require removing and reinstalling existing truss
- Requires a large fender system to protect the existing truss and boaters

Truss Concept 2

This prefabricated Contech “keystone” style truss option offers a bit more flare than Truss Concept 1 with the parabolic shape trusses. The main span of the proposed truss spans completely over the existing truss between the existing east and west piers. The main span is 226’-3”. The approach spans, consisting of smaller “keystone” style prefabricated trusses, span from the existing east and west piers to new east and west abutments, respectively. The approach spans are each 140’-0”. The deepest portion of the main span varying depth truss is 23’-0”. The deepest portion of the approach span trusses is 15’-0”. The two proposed piers are assumed to be concrete.

Advantages of this concept are:

- Prefabricated truss elements provide quick installation and reduced site preparation time
- Minimal maintenance
- Relatively low cost
- Leaves the option of removing and reinstalling the existing truss up to the contractor since there is not a proposed center pier.

Disadvantages of this concept are:

- Requires a large fender system to protect the existing truss and boaters

Truss Concept 3

This concept incorporates the reuse of the existing Conrail truss in the closed position (truss is longitudinal to trail baseline). The existing truss is raised to provide 50 foot vertical clearance between bottom chord and mean high water elevation. The existing 226'-3" long truss would be supported by new pier extensions at the center pier and the east and west piers, creating two equal spans of 113'-1 ½". The pier extensions are assumed to be concrete. The 140'-0" approach spans consist of single-span prefabricated Contech "connector" style trusses. The approach spans are supported at the east and west piers and the east and west abutments, respectively. The superstructure consists of a composite concrete deck.

Advantages of this concept are:

- Reuses a historic element and gives it prominence in the new structure
- Reduces cost by efficiently incorporating the existing rehabilitated truss into the structure
- Lowest cost option
- Reduced size of required fender system due to smaller obstruction in the navigable channel

Disadvantages of this concept are:

- The existing truss is not very aesthetically pleasing when combined with smaller span & shallower trusses of a different type and when it is raised up to this elevation.
- There would be additional and possibly complicated labor associated with jacking the very large existing truss to the required elevation.
- Significant repairs need to be made to the truss in order to safely carry pedestrian and bicyclist loads.

Cable-Stay Concept 1

This concept also incorporates the reuse of the existing Conrail truss in the closed position, similar to truss concept 3. However, the approach spans are comprised of double mast "fan" type cable-stay structures. Cable-stay concept 1 is thought to be a "hybrid" structure that combines a very old structure with a very new structure. The masts are assumed to be steel and supported on the existing abutment. Each cable-stay portion of the structure is 163'-6" based on location of existing piers and abutments and proposed abutment. The back span from mast to proposed abutment is 65'-8 5/8" and the front span from mast to pier is 97'-9 3/8". The superstructure is a girder and floorbeam system with a composite concrete deck. The approximate floorbeam spacing and cable-stay spacing at deck level is assumed to be 20'-0"

A decision would have to be made if it is more efficient and cost effective to account for the shorter span in the mast design, to balance the spans with a large concrete counterweight or to extend the length of the structure to create equal spans. Although the original loads the bridge was designed for far exceed what the current proposed loads are, it is questionable if the existing abutment is sufficient to take all the additional compressive reaction from the masts. Further analysis can verify the adequacy of the existing abutment for this load.

Advantages of this concept are:

- Reuses a historic element and gives it prominence in the new structure
- Reduces cost by efficiently incorporating the existing rehabilitated truss into the structure
- Relatively low cost among the cable-stay structures
- Reduced size of required fender system due to smaller obstruction in the navigable channel
- The cable stay portion of the structure has many aesthetic qualities

Disadvantages of this concept are:

- The existing truss is not very aesthetically pleasing raised up to this elevation, particularly when combined with a radically different type of superstructure.
- There would be additional and possibly complicated labor associated with jacking the very large existing truss to the required elevation
- Significant repairs need to be made to the truss in order to safely carry pedestrian and bicyclist loads.
- Requires contractors specialized in cable-stayed bridge construction that may not be readily available in the region.

Cable-Stay Concept 2

This concept is the most striking concept aesthetically. The prominent feature of this structure is the continuous steel mast that supports the cable stays while providing unity and symmetry. The portions of the mast that rise above the structure are rectangular hollow steel tapered tube sections. The steel support at each pier and abutment is a rectangular hollow steel section with a constant width and depth. The superstructure is a stringer floorbeam system with a composite concrete deck. The approximate floorbeam spacing and cable-stay spacing at deck level is assumed to be 20’-0”.

Advantages of this concept are:

- Has many aesthetic qualities
- Contrasts with the existing structure while providing unity and symmetry in design
- Has a unique shape that will attract users and visitors

Disadvantages of this structure are:

- Highest cost option
- Requires contractors that specialize in cable-stay construction that may not be readily available in the region
- Requires a large fender system to protect the existing truss and boaters

Cable-Stay Concept 3

This style of this concept is similar to cable-stay concept 3. However, in this case the main spans consist of cable-stay supported structure that passes over the existing truss in its current open position. The cable pairs are configured in a harp pattern and are supported by two double-mast steel pylons. The proposed pylons are situated on the existing west and east piers, creating a

main span equal to 226’-3”. The steel pylons are made of hollow steel boxes. The approach span supports are located at existing west and east abutments, which creates cable supported back spans equal to 97’-9 3/8”. The 65’-8 5/8” approach spans are assumed to be comprised of prefabricated Contech trusses for cost purposes. However, there are numerous other superstructure types that could support that span length. The proposed east and west piers are 3’x14’ solid concrete piers supported at existing east and west abutment locations, respectively.

Advantages of this concept are:

- The structure is a very aesthetically pleasing modern structure with clean lines that would attract users and the public
- The concept provides passing completely over the existing truss so there the involved operation of lifting the existing truss to a higher vertical clearance would not be required

Disadvantages of this concept are:

- Requires contractors that specialize in cable-stay construction that may not be readily available in the region
- There is a relatively high cost, however, not as high as cable-stay concept 2
- Requires a large fender system to protect the existing truss and boaters

VIII. Cost Estimates

The table below shows a summary of the cost estimates for all six structure alternates. Detailed cost estimates and calculations are given in Appendix C. The cost estimate is preliminary and includes a contingency to cover costs that cannot be determined without a more detailed design. There is a 15% contingency built into the truss options and a 20% contingency built into the cable-stay options. The reason for the difference in the contingencies is the trusses are a pre-engineered product that we received pricing from a fabricator that has a good handle on the required structure to meet the needs. The cable-stay concepts include a higher contingency because the design has not been engineered to as full of an extent as the trusses and is only based on rough calculations.

Structure Cost Estimates	
Concept	**Estimated Cost**
Truss Concept 1	$ 4,601,755
Truss Concept 2	$ 4,629,896
Truss Concept 3	$ 3,496,651
Cable-Stay Concept 1	$ 4,801,213
Cable-Stay Concept 2	$ 6,398,132
Cable-Stay Concept 3	$ 5,262,544

The above cost estimate does not include the cost of the trail portions off the structure. The recent Dupont Crescent trail project, which consisted of 14 foot wide trails throughout the majority of the project site, received a low bid of $1,723,544. The low bid cost without including any trees or planting was $1,444,398. There was approximately 4,474 feet of trail associated with the Dupont Crescent project, which yields a cost of about $333 per linear foot of trail. The trails in the vicinity of the Grays Ferry pedestrian bridge will be of a similar nature, with the exception of the large turf areas with extensive greenery constructed in the Dupont Crescent. There is approximately 1669 feet of asphalt trail proposed for this project. Based on the aforementioned bid price without planting and not including a contingency, the approximate cost for the trail portion of this project is $555,777. The following table represents total project cost estimates.

The cost estimates do not include the cost of right-of-way acquisition, utility relocation, railroad agreements, or construction management and inspection services. The cost estimates use current pricing and do not account for inflation.

Total Project Cost Estimates	
Concept	**Estimated Cost**
Truss Concept 1	$ 5,157,532
Truss Concept 2	$ 5,185,673
Truss Concept 3	$ 4,052,428
Cable-Stay Concept 1	$ 5,356,990
Cable-Stay Concept 2	$ 6,953,909
Cable-Stay Concept 3	$ 5,818,321

IX. Public Involvement

Two stakeholder meetings were conducted to solicit public participation within the project development process. These meetings involved representatives of Bartram Gardens, Philadelphia Trolley Works, Delaware Valley Regional Planning Commission (DVRPC), City of Philadelphia Commerce Department, Philadelphia City Planning Commission, Schuylkill River Park Alliance (SRPA), Bicycle Coalition, and Southwest Community Development Corporation (SWCDC) and took place as follows:

- Stakeholder Committee Meeting #1: Nov. 12, 2009– 1:30 to 3:00 Philadelphia Trolley Works, Philadelphia, PA
- Stakeholder Committee Meeting #2: Sept. 09, 2010– 10:00 to 12:00 held at the Philadelphia Trolley Works, Philadelphia, PA.

The minutes of these meetings are presented in Appendix F.

The first stakeholders meeting discussed various ways of achieving the crossing to provide a connection between the DuPont Crescent which is in design on the east side of the river and Bartram Gardens on the west side of the river. One suggested method was to build a swing bridge. The issue of clearance over the river at the suggested crossing was discussed. Before the required vertical clearance could be determined the designers needed to obtain additional information from the Coast Guard and the Trigen Energy, the main generator of boat traffic in this area.

During the second stakeholders meeting, the group requested a follow-up to the swing bridge concept. Joe Syrnick stated that he did not feel the City of Philadelphia would want to absorb the cost to operate and maintain a swing bridge. The group requested an official response from the City on this matter. The design team provided an update of the vertical clearance over the river. They reported that the Coast Guards and boat traffic in the area require a 50 ft clearance. Various structural concepts were presented by the design team and the attendees were able to narrow down the choice to Truss Concept #3.

As a follow up to the second meeting the SRDC wrote a letter and met with the City to discuss the possibility of providing a swing bridge at this location. The letter and the response are in Appendix F.

Additionally, a generally advertised public meeting (Public Open House) was held on Wednesday February 8, 2012 at the University Museum, of the University of Pennsylvania, 3260 South Street, Philadelphia. This public meeting was attended by 82 people who, following the presentation of the study and recommendation, were given the opportunity to ask questions and offer input. In general, there was a great support for the project. A copy of the flyer announcing this meeting is included in Appendix F.

X. Recommendation

Six different concepts were investigated and presented in this report. They are all feasible but each has different aesthetic qualities and carries a different cost. The results of the stakeholders meetings narrowed the number of concepts to one concept which is Truss Concept #3 (Option3). The opinion of the stakeholders was in line with that of the design team and the SRDC. Therefore, Truss Concept 3 with a cost of $ 4,052,428.00 (option 3) will be carried through preliminary and final design.

XI. Acknowledgements

The Schuylkill River Development Corporation (SRDC) acknowledges the assistance provided by its project partners including members of the Project Study Committee. They are as follows:

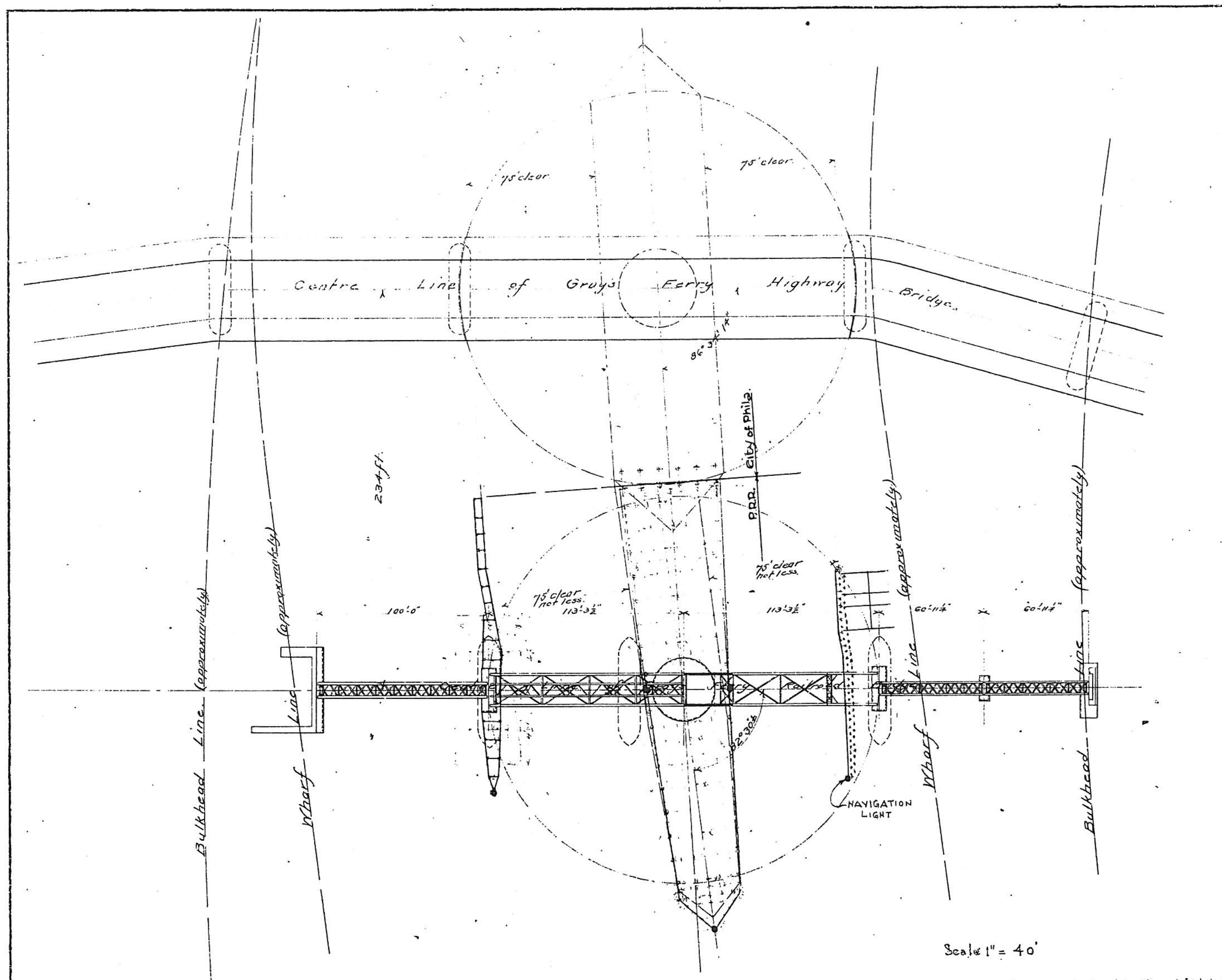
Cynthia Dunlap	PA Department of Conservation and Natural Resources
Jon Edelstein	Brownfields Manager City of Philadelphia
Deborah Schaaf	Senior Planning Philadelphia City Planning Commission
Louise Turan	Executive Director Bartram's Garden
Sarah Clark Stuart	Schuylkill River Park Alliance
Donna Henry	Executive Director Southwest CDC
Michael Kates	Vice President Philadelphia Trolley Works
Karen Cilurso	Senior Regional Planner DVRPC
Lane Fike	Director of Capital Programs SRDC
Joseph Sullivan, PE	Project Manager Consultant Study Team
Joseph Syrnick	SRDC President

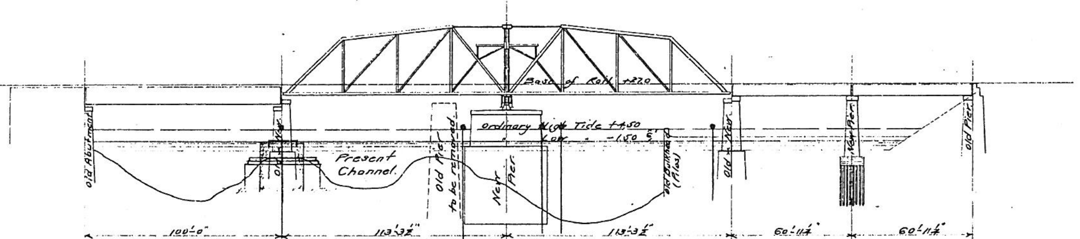
Additionally, this project is financed in part by a grant from the Community Partnerships Program, Environmental Stewardship Fund, under the administration of the Pennsylvania Department of Conservation and Natural Resources, Bureau of Recreation and Conservation and in part by the William Penn Foundation using a Take Me to the River Grant administered by the Delaware Valley Regional Planning Commission.

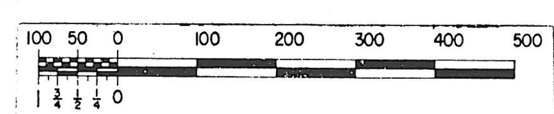
SRDC is indebted to these project partners without whom this project could not have been completed.

APPENDIX A

(Existing Plans)







Copy of Permit authorizing the reconstruction of the Grays Ferry Bridge over the Schuylkill River on the line of the Philada. Wilmington and Baltimore Railroad in Philada.

WHEREAS, By Section 9 of an act of Congress, approved March 3rd 1899, entitled "An act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," it is provided that bridges, dams, dikes, or causeways may be built under authority of the legislature of a State across rivers and other waterways the navigable portions of which lie wholly within the limits of a single State, provided the location and plans thereof are submitted to and approved by the Chief of Engineers and by the Secretary of War before construction is commenced;

AND WHEREAS, The Philadelphia, Wilmington and Baltimore Railroad Company, a corporation existing under the laws of the State of Pennsylvania, having authority of the legislature of the State of Pennsylvania, to reconstruct a bridge across Schuylkill River at Grays Ferry, Philadelphia, in said State, has submitted a map of the location and plans of the same, which have been approved by the Chief of Engineers;

NOW THEREFORE, This is to certify that the map of the location and plans of said bridge, which are hereto attached, are hereby approved by the Secretary of War, subject to the following conditions:

1.-- That the piers of the bridge shall be furnished with such fender systems as will provide for the easy and unobstructed passage of boats through the draw channels, such fenders to be constructed in accordance with plans satisfactory to the district engineer officer.

2.-- That the sides of the fender of the centre draw pier shall be continuous with the sides of the fender of the centre pier of the bridge under construction by the city of Philadelphia just above the site of the railroad bridge.

3.-- That the clearance of the bridge above high water shall be the same as that of the said city bridge, which is 22 feet.

4.-- That the Engineer Officer of the United States Army, in charge of the district within which the bridge is to be rebuilt, may supervise its reconstruction, in order that said plans shall be complied with.

Witness my hand this 8th day of February, 1901.

Elihu Root

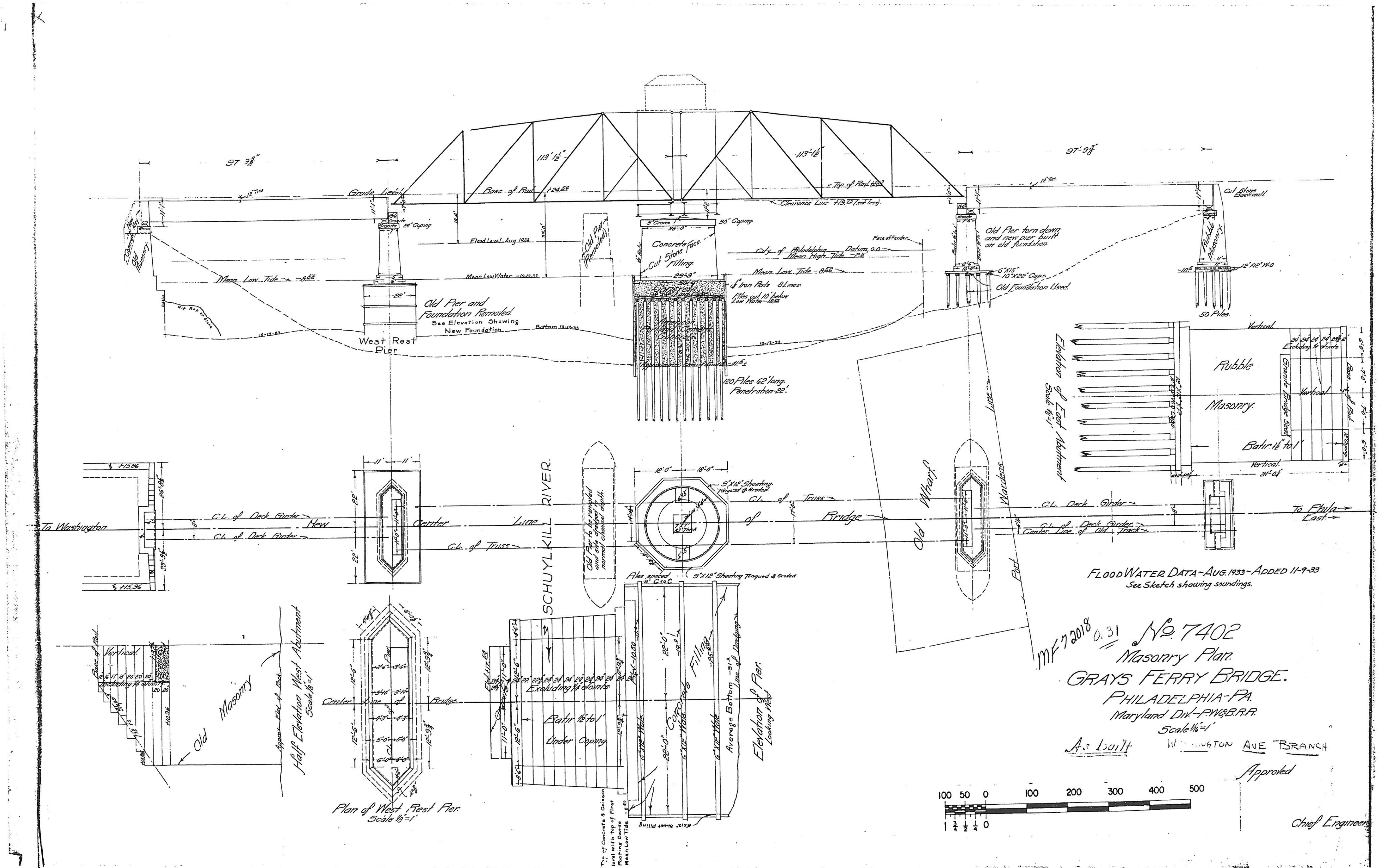
Secretary of War.

Note! Original permit on file in the office of the Real Estate Agent of the Pennsylvania Railroad.

MF 164971
Br 0.31

BRIDGE No 0.31

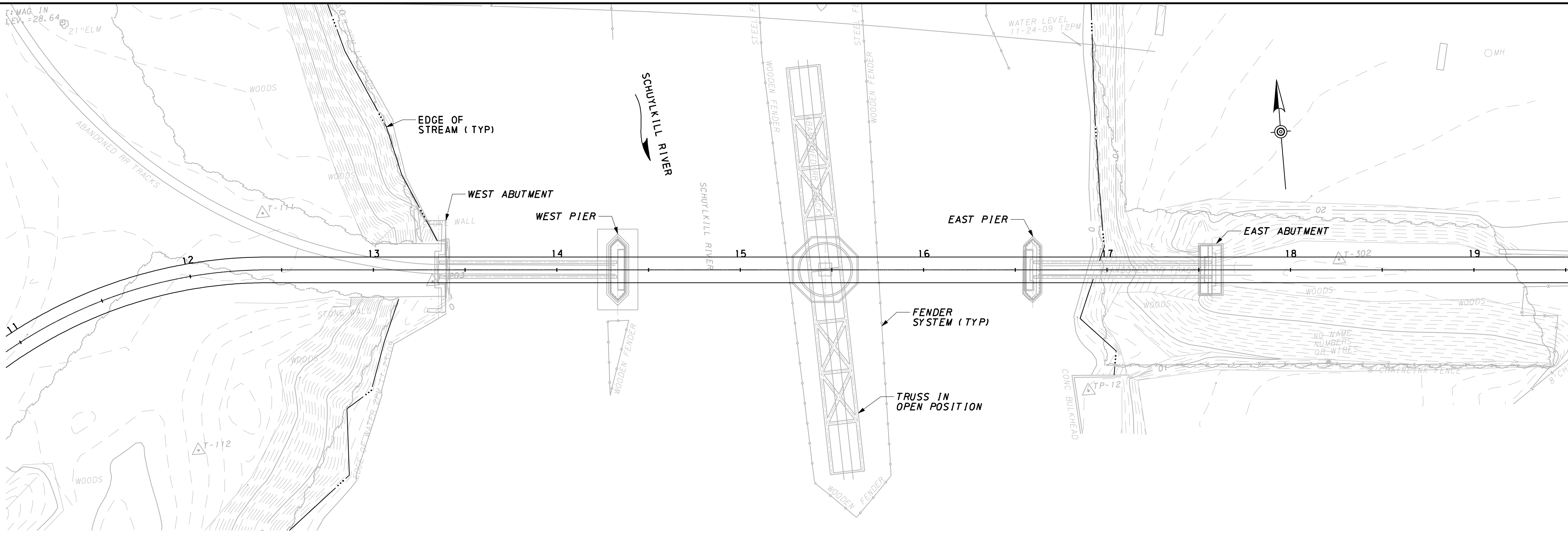
No 7402
Gray's Ferry Bridge
over Schuylkill River,
Phil'a, Pa.
P.W. and B.R.R. - Maryland Division.
WASH. AVE. BR. P.T. DIV.
General Drawing showing proposed reconstruction of Bridge.
Dec. 28th 1900.

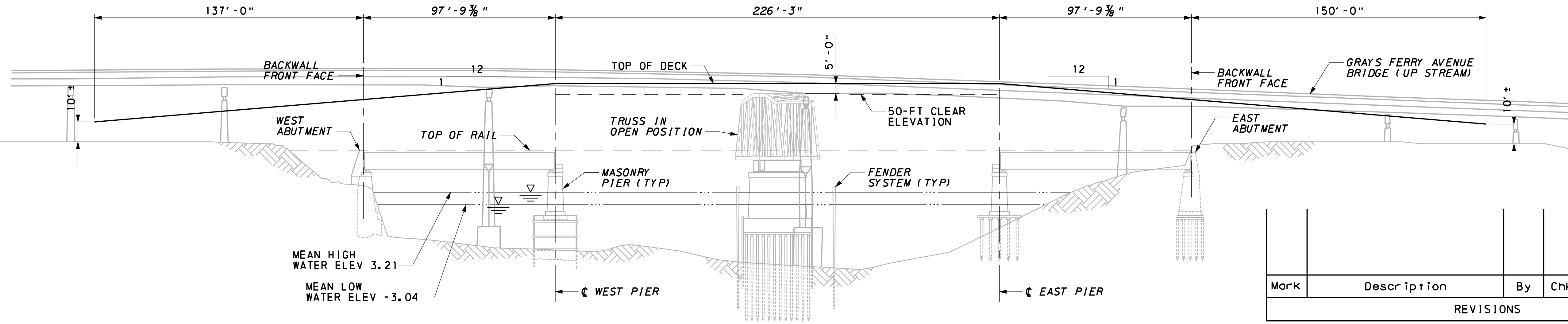


MF 7 2018 0.31
No. 7402
Masonry Plan.
GRAYS FERRY BRIDGE.
PHILADELPHIA-PA.
Maryland Div.-P.W.&B.R.R.
Scale 1/16"=1'
As built
Approved
Chief Engineer
FLOOD WATER DATA-AUG. 1933-ADDED 11-9-33
See Sketch showing soundings.
SCHUYLKILL RIVER
To Washington
To Phila East
Center Line of Bridge
West Rest Pier
Old Pier and Foundation Removed.
See Elevation Showing New Foundation.
Old Pier torn down and new pier built on old foundation
120 Piles 62' long. Penetration 22'.
Plan of West Rest Pier. Scale 1/8"=1'
Half Elevation West Abutment Scale 1/8"=1'
Elevation of East Abutment Scale 1/8"=1'
Old Masonry
Rubble Masonry
Old Wharf
50 Piles.

APPENDIX B

(Conceptual Plans)





GENERAL ELEVATION

15 0 15 30 FEET

SCALE: 1"=30'

Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

XXXXXXXXXXXXXXXXXXXX

GENERAL PLAN & ELEVATION

RECOMMENDED ____________

SHEET X OF XX

XXXXX

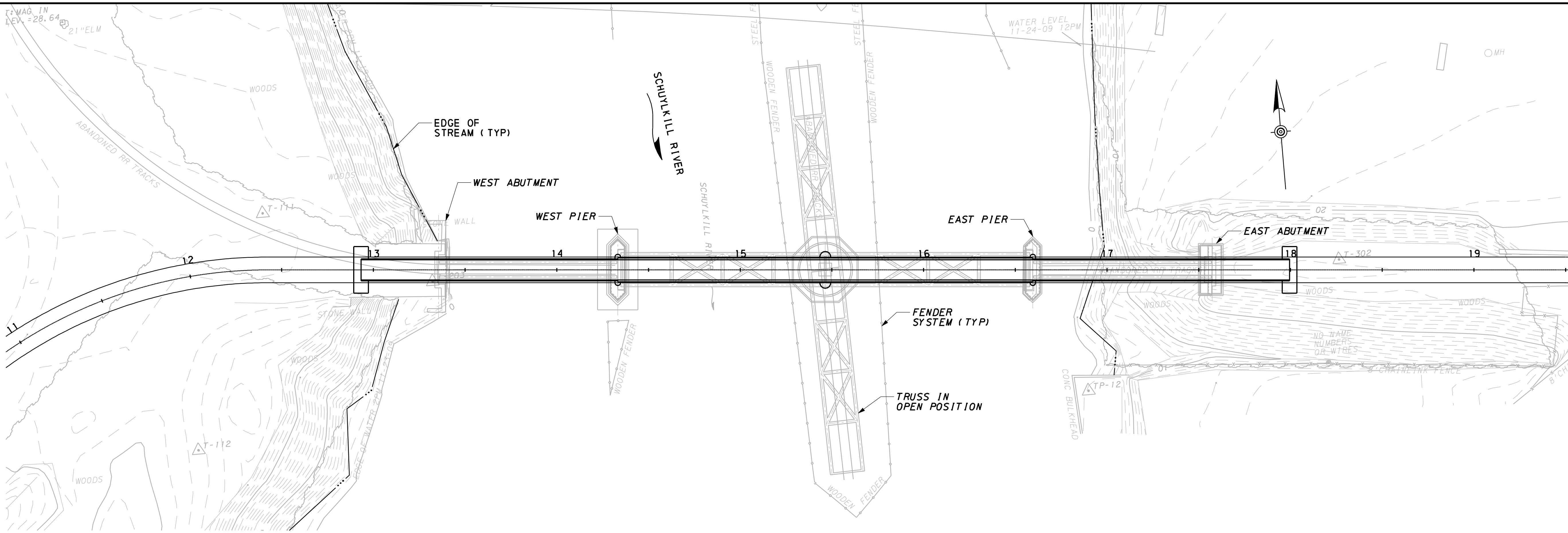
NOTES:

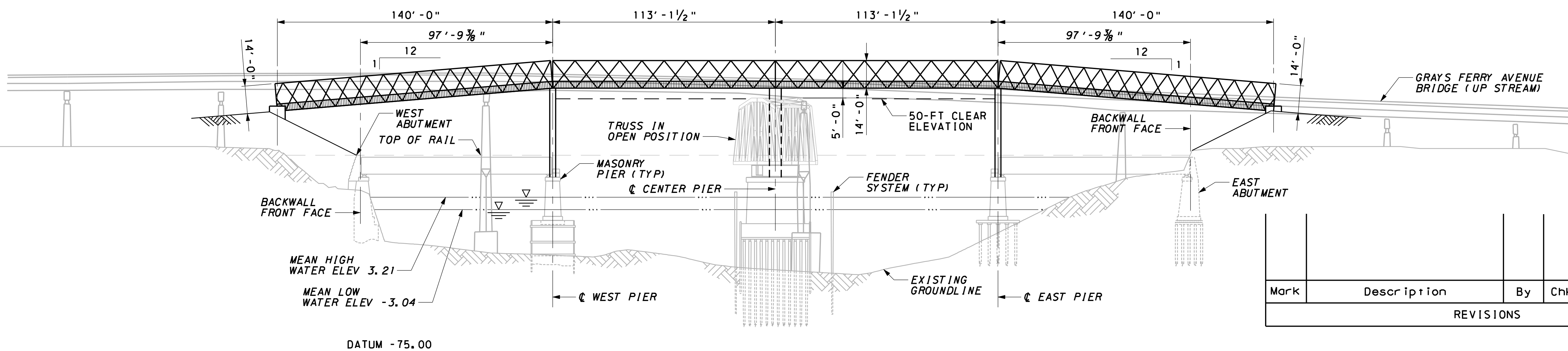
1. EXISTING STRUCTURE DRAWN TO SCALE AS CLOSELY AS POSSIBLE BASED ON 1901 EXISTING DRAWINGS.

AMMANN & WHITNEY PENNSYLVANIA, INC.
CONSULTING ENGINEERS
TWO GATEWAY CENTER
PITTSBURGH, PA 15222

DES: XXX
DWG: AIS
CKD: XXX
DWG. NAME: 3061sELEVATION.dgn

TIME: 10:12:42 AM
DATE: 9/24/2010
H:\PA-CLIENTS\3061\3061-CADD\3061-S\3061sELEVATION.dgn





GENERAL ELEVATION

15 0 15 30 FEET

SCALE: 1"=30'

Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

NOTES:

1. EXISTING STRUCTURE DRAWN TO SCALE AS CLOSELY AS POSSIBLE BASED ON 1901 EXISTING DRAWINGS.

TIME: 10:12:45 AM

DATE: 9/24/2010

n:\pa-clients\3061\3061-cadd\3061-s\3061sTRUSS1.dgn

DES: XXX
DWG: AIS
CKD: XXX
DWG. NAME: 3061sTRUSS1.dgn

AMMANN & WHITNEY PENNSYLVANIA, INC.
CONSULTING ENGINEERS
TWO GATEWAY CENTER
PITTSBURGH, PA 15222

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

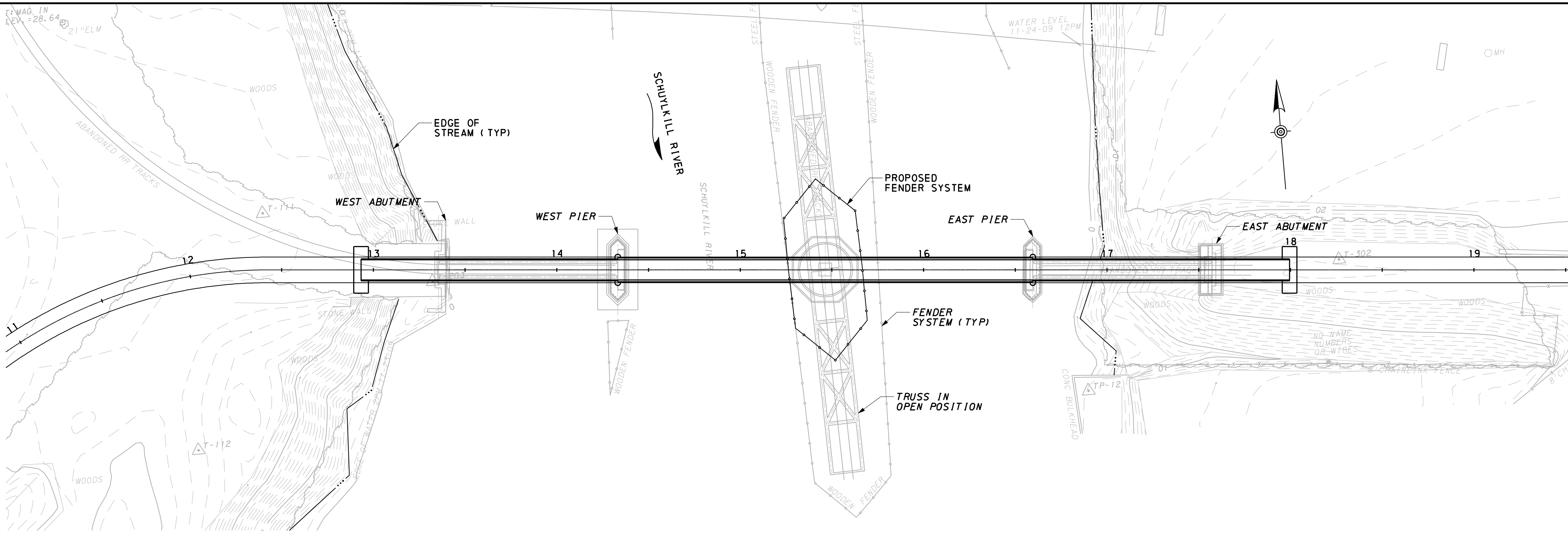
XXXXXXXXXXXXXXXXXXXX

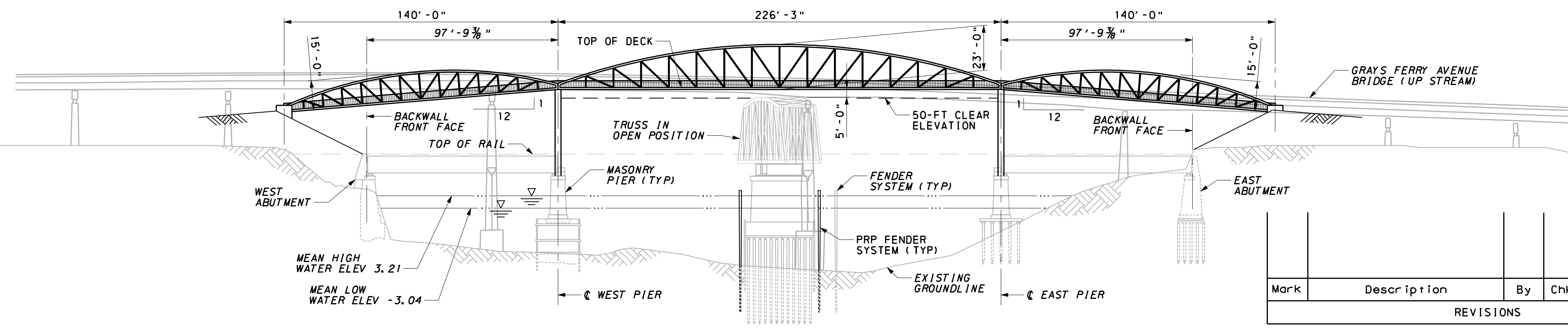
TRUSS CONCEPT 1

RECOMMENDED

SHEET X OF XX

XXXXX





GENERAL ELEVATION

15 0 15 30 FEET

SCALE: 1"=30'

Mark	Description	By	Chk'd.	Recm'd.	Date

REVISIONS

NOTES:

1. EXISTING STRUCTURE DRAWN TO SCALE AS CLOSELY AS POSSIBLE BASED ON 1901 EXISTING DRAWINGS.

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

XXXXXXXXXXXXXXXXXXXX

TRUSS CONCEPT 2

RECOMMENDED ____________

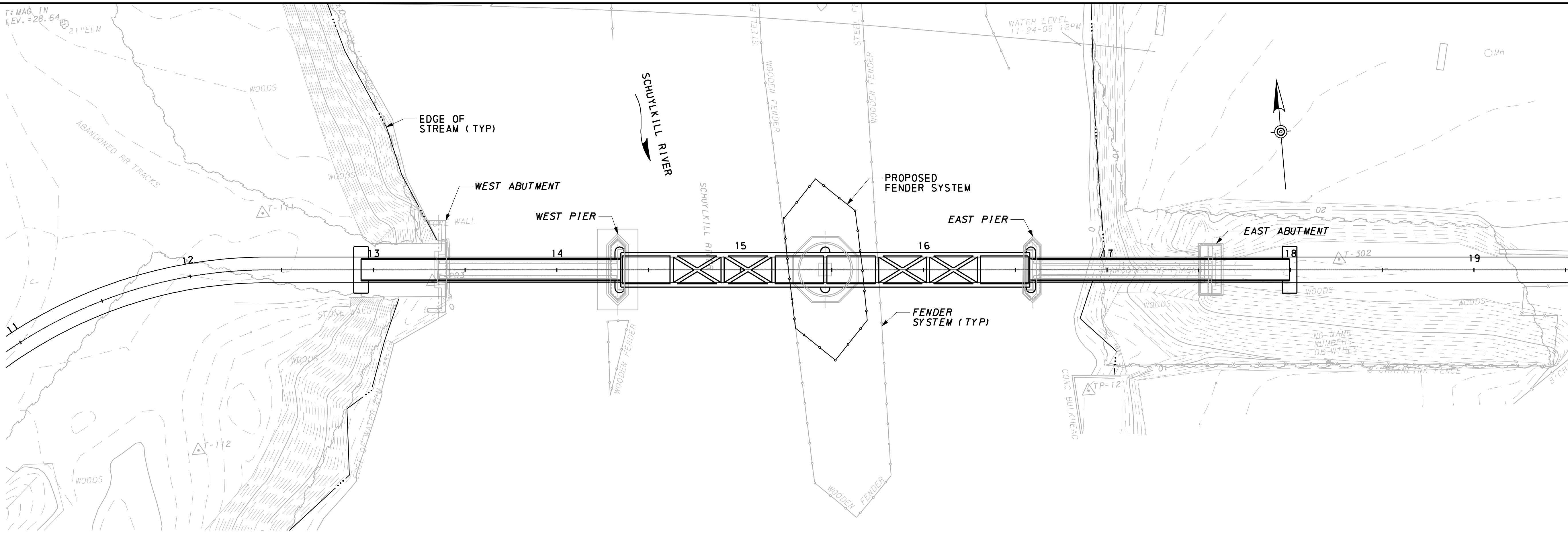
SHEET X OF XX

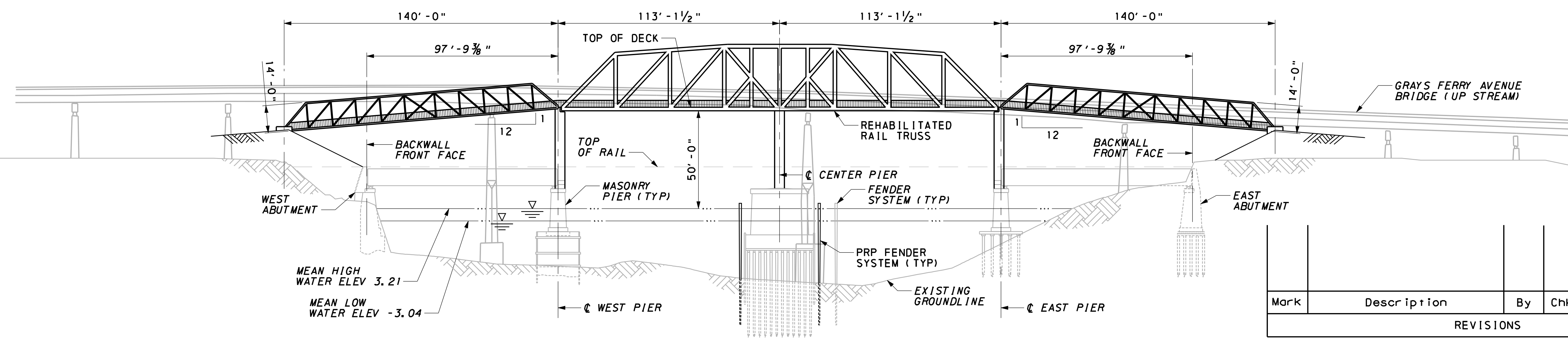
XXXXX

AMMANN & WHITNEY PENNSYLVANIA, INC.
CONSULTING ENGINEERS
TWO GATEWAY CENTER
PITTSBURGH, PA 15222

DES: XXX
DWG: AIS
CKD: XXX
DWG. NAME: 3061sTRUSS2.dgn

TIME: 10:12:49 AM
DATE: 9/24/2010
m:\pa-clients\3061\3061-cadd\3061-s\3061sTRUSS2.dgn





GENERAL ELEVATION

15 0 15 30 FEET

SCALE: 1"=30'

Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

XXXXXXXXXXXXXXXXXXXX

TRUSS CONCEPT 3

RECOMMENDED ____________

SHEET X OF XX

XXXXX

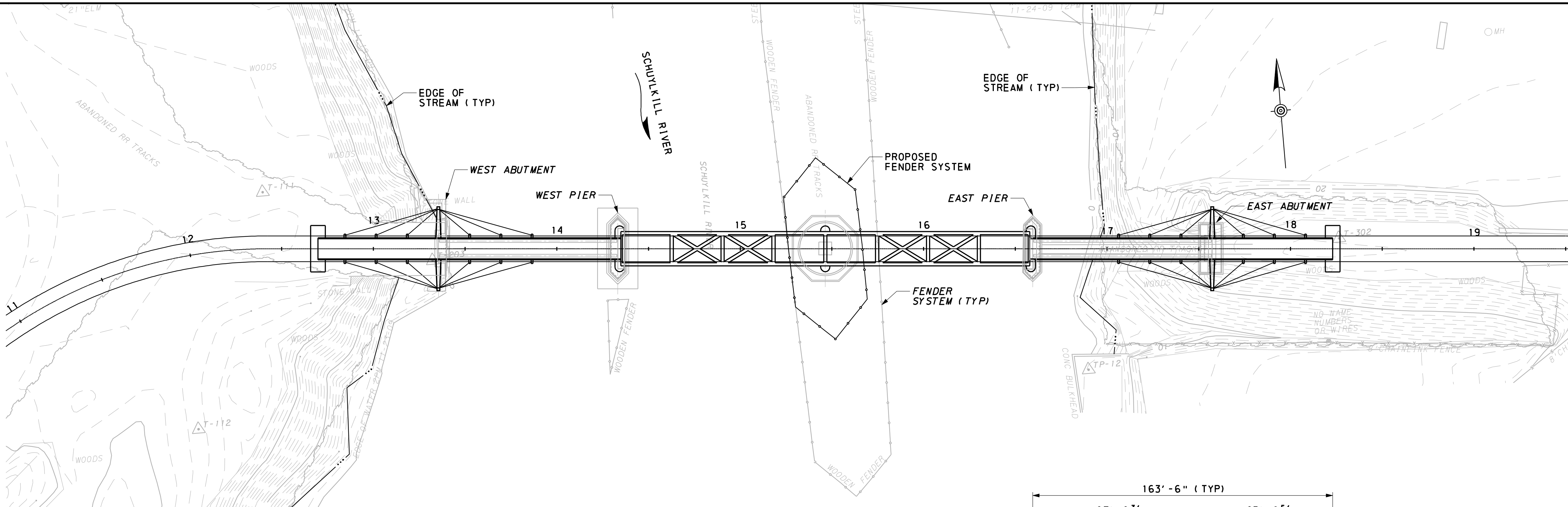
AMMANN & WHITNEY PENNSYLVANIA, INC.
CONSULTING ENGINEERS
TWO GATEWAY CENTER
PITTSBURGH, PA 15222

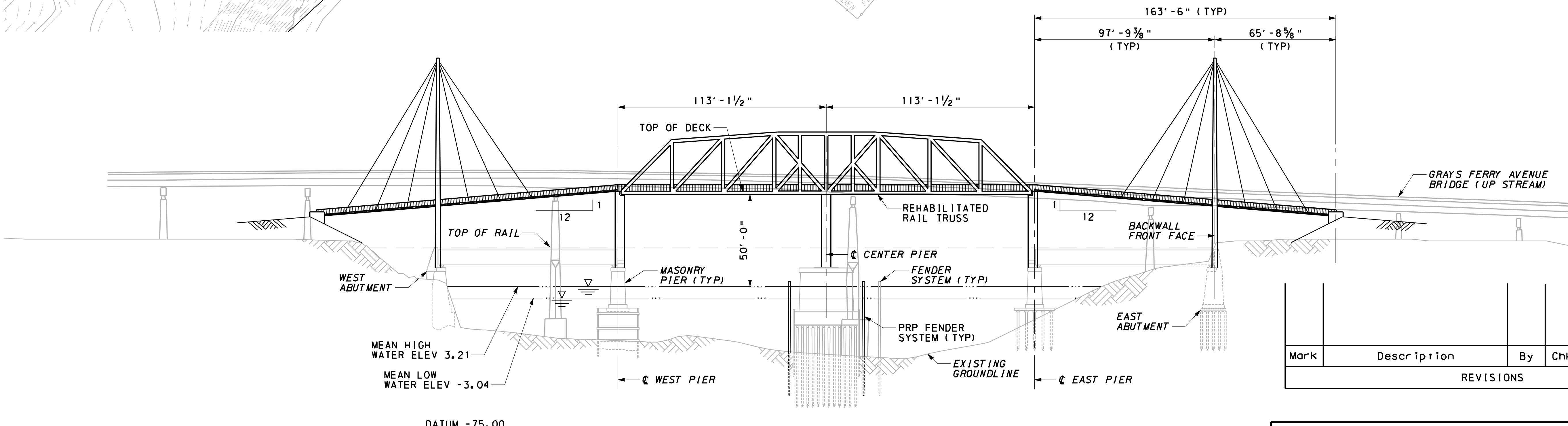
NOTES:

1. EXISTING STRUCTURE DRAWN TO SCALE AS CLOSELY AS POSSIBLE BASED ON 1901 EXISTING DRAWINGS.

DES: XXX
DWG: AIS
CKD: XXX
DWG. NAME: 3061sTRUSS3.dgn

TIME: 10:12:52 AM
DATE: 9/24/2010
m:\pa-clients\3061\3061-cadd\3061-s\3061sTRUSS3.dgn





GENERAL ELEVATION

15 0 15 30 FEET

SCALE: 1"=30'

Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

NOTES:

1. EXISTING STRUCTURE DRAWN TO SCALE AS CLOSELY AS POSSIBLE BASED ON 1901 EXISTING DRAWINGS.

TIME: 10:12:56 AM

DATE: 9/24/2010

m:\pa-clients\3061\3061-cadd\3061-s\3061sCABLESTAY1.dgn

DES: XXX
DWG: AIS
CKD: XXX
DWG. NAME: 3061sCABLESTAY1.dgn

AMMANN & WHITNEY PENNSYLVANIA, INC.
CONSULTING ENGINEERS
TWO GATEWAY CENTER
PITTSBURGH, PA 15222

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

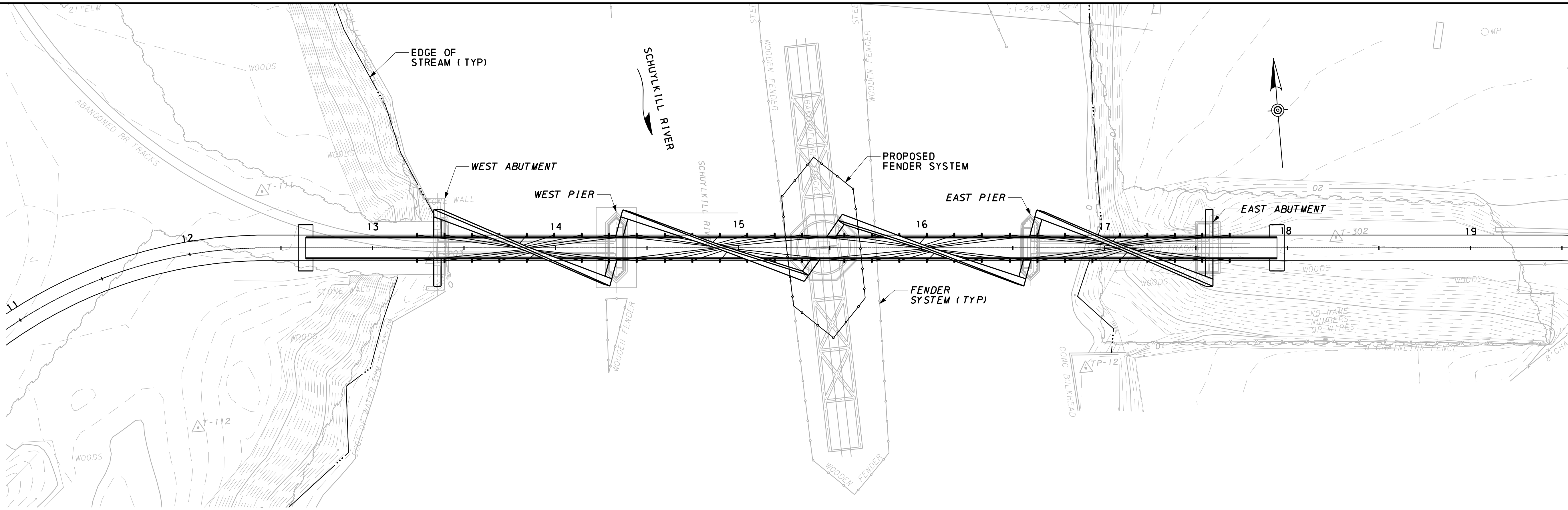
XXXXXXXXXXXXXXXXXXXX

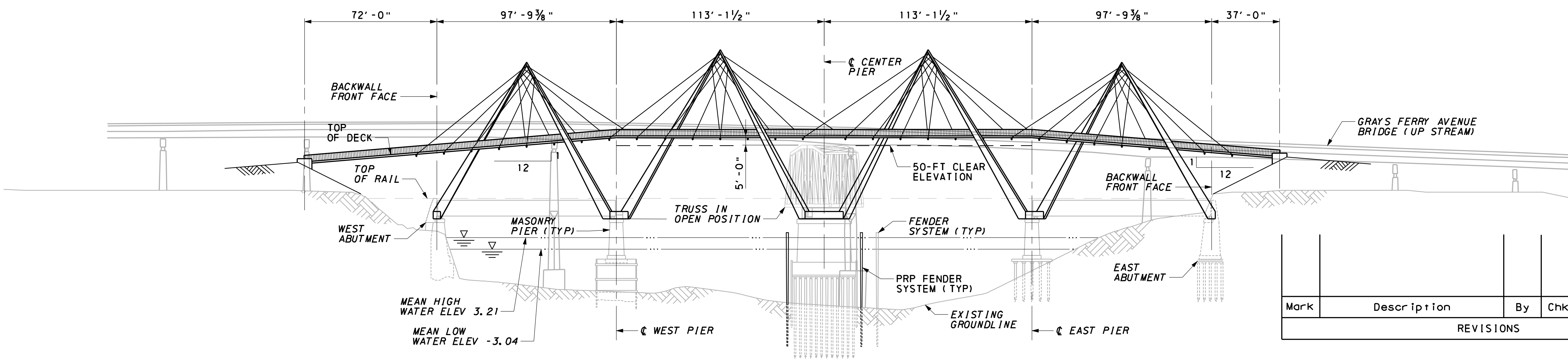
CABLE-STAY CONCEPT 1

RECOMMENDED

SHEET X OF XX

XXXXX





GENERAL ELEVATION

15 0 15 30 FEET

SCALE: 1"=30'

Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

XXXXXXXXXXXXXXXXXXXX

CABLE-STAY CONCEPT 2

RECOMMENDED

SHEET X OF XX

XXXXX

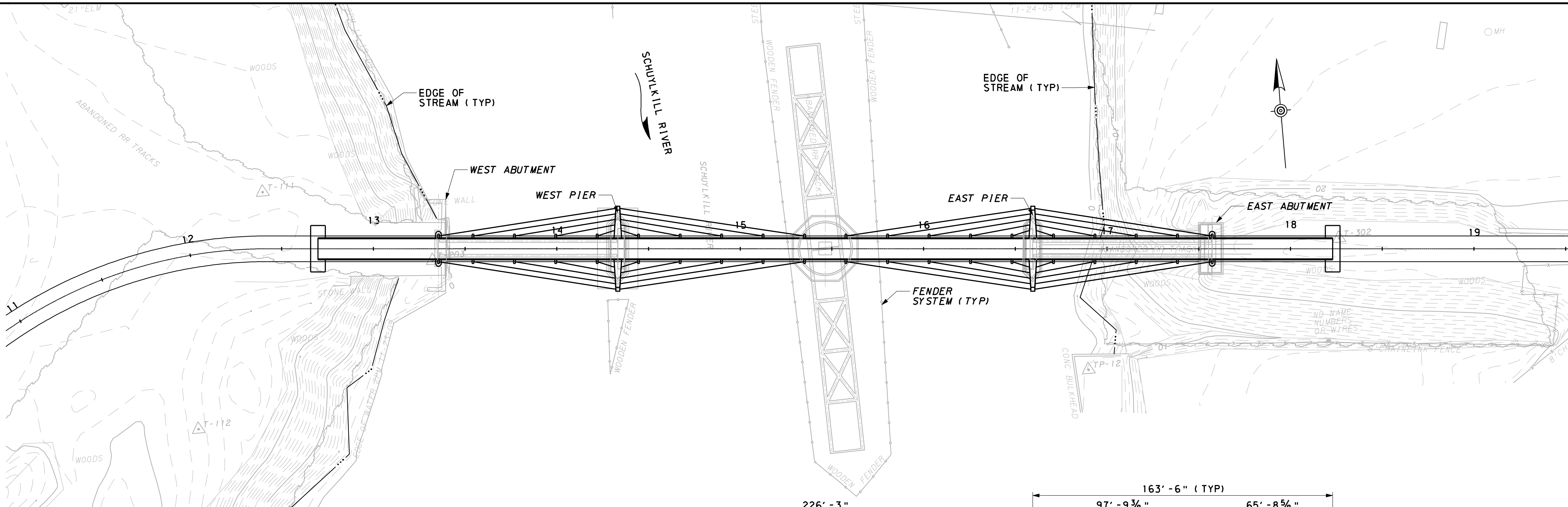
AMMANN & WHITNEY PENNSYLVANIA, INC.
CONSULTING ENGINEERS
TWO GATEWAY CENTER
PITTSBURGH, PA 15222

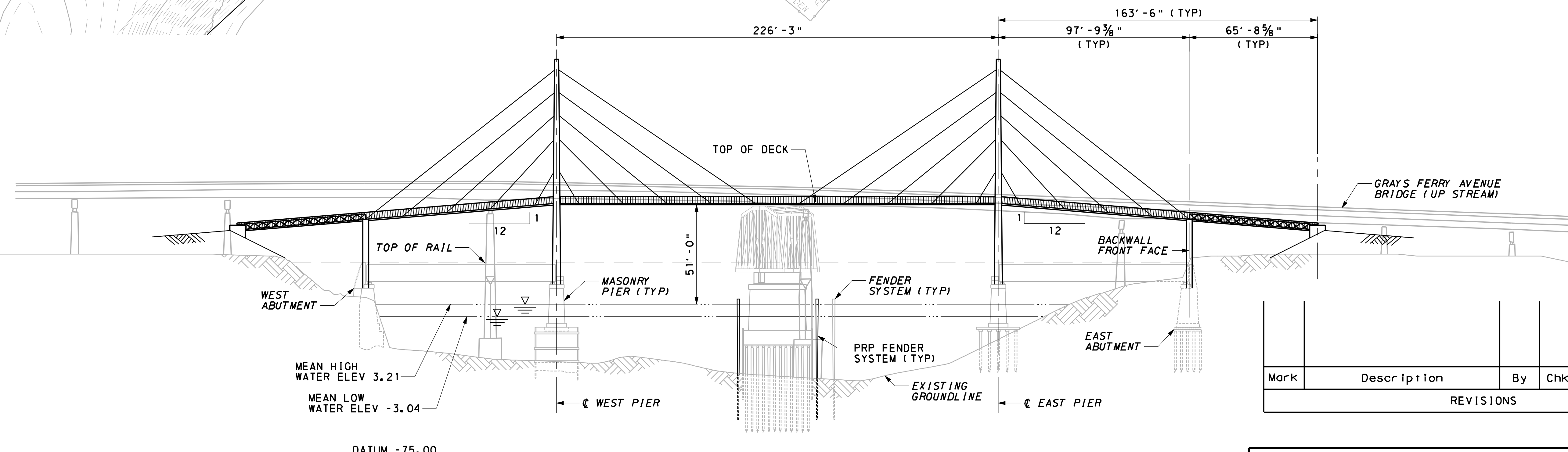
NOTES:

1. EXISTING STRUCTURE DRAWN TO SCALE AS CLOSELY AS POSSIBLE BASED ON 1901 EXISTING DRAWINGS.

DES: XXX
DWG: AIS
CKD: XXX
DWG. NAME: 3061sCABLESTAY2.dgn

TIME: 10:12:59 AM
DATE: 9/24/2010
m:\pa-clients\3061\3061-cadd\3061-s\3061sCABLESTAY2.dgn





GENERAL ELEVATION

15 0 15 30 FEET

SCALE: 1"=30'

NOTES:

1. EXISTING STRUCTURE DRAWN TO SCALE AS CLOSELY AS POSSIBLE BASED ON 1901 EXISTING DRAWINGS.

Mark	Description	By	Chk'd.	Recm'd.	Date
REVISIONS					

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

XXXXXXXXXXXXXXXXXXXX

CABLE-STAY CONCEPT 3

RECOMMENDED

SHEET X OF XX

XXXXX

AMMANN & WHITNEY PENNSYLVANIA, INC.
CONSULTING ENGINEERS
TWO GATEWAY CENTER
PITTSBURGH, PA 15222

DES: XXX
DWG: AIS
CKD: XXX
DWG. NAME: 3061sCABLESTAY1.dgn

m:\pa-clients\3061\3061-cadd\3061-s\3061sCABLESTAY3.dgn

DATE: 9/24/2010

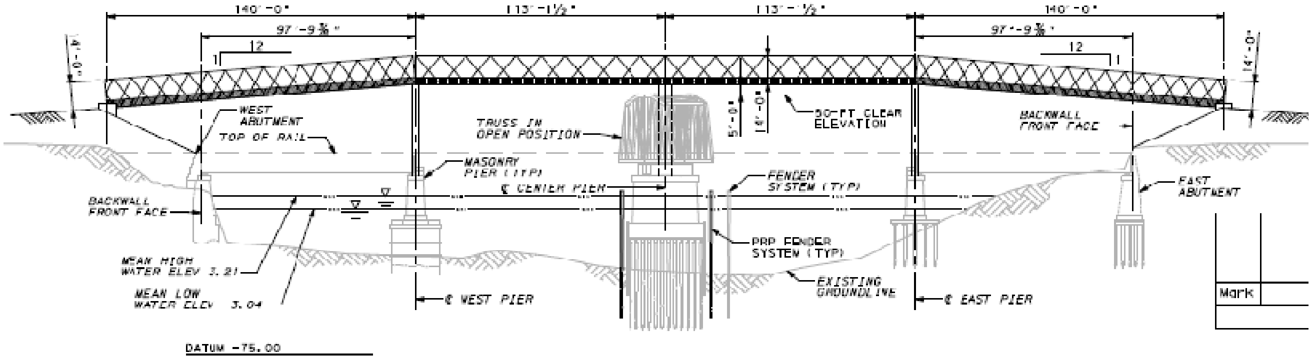
TIME: 10:13:02 AM

APPENDIX C

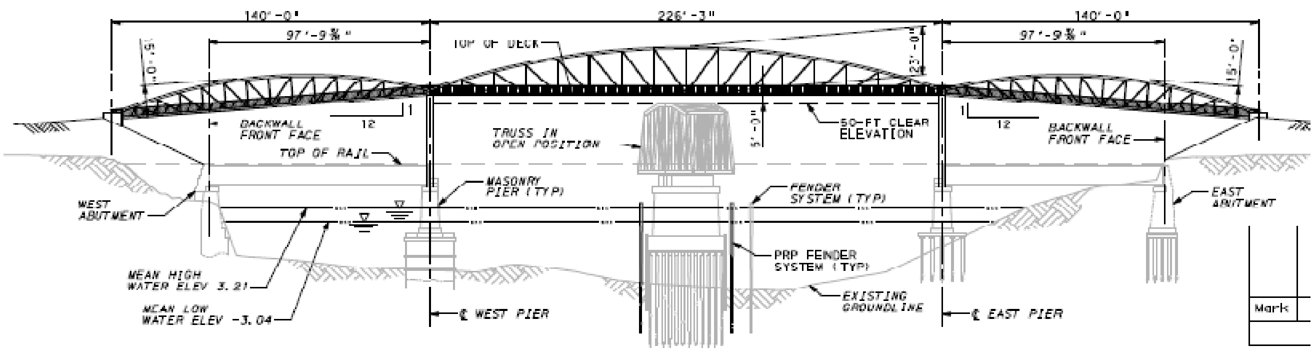
(Quantity and Estimate Calculations)

AMMANN & WHITNEY

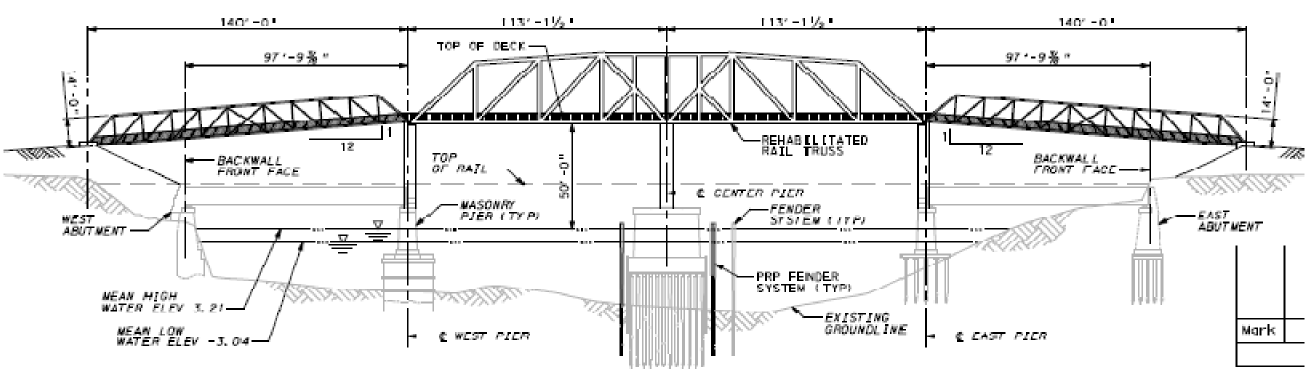
Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Summary of Preliminary Cost Estimates**	Job No:	**3061**
Designed by:	**AL**	Checked by:	
Date:	**July 8, 2010**	Date:	



1 **$4,601,755**



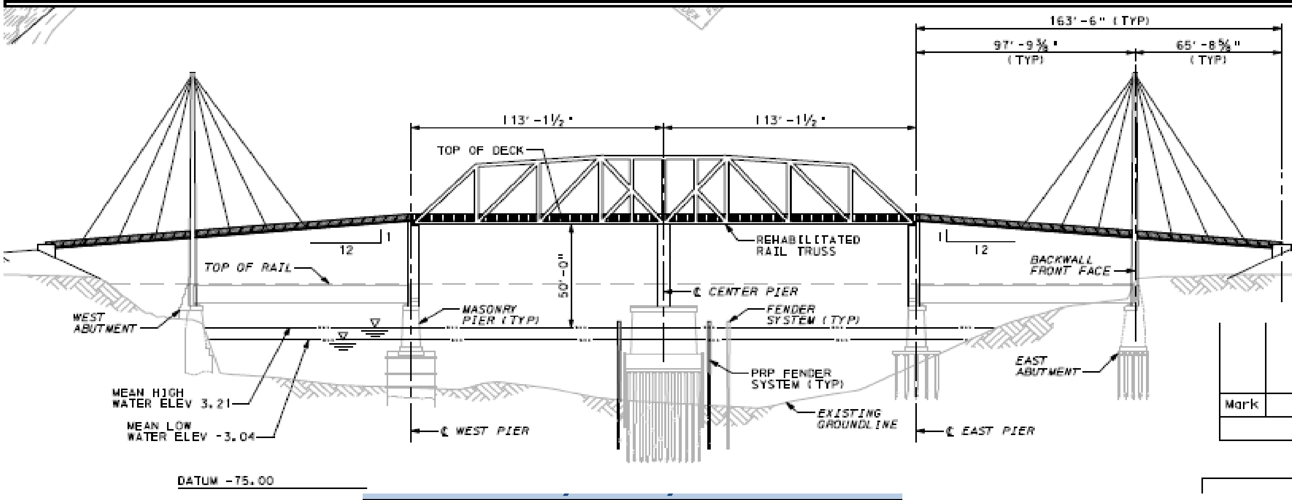
2 **$4,629,896**



3 **$3,496,651**

AMMANN & WHITNEY

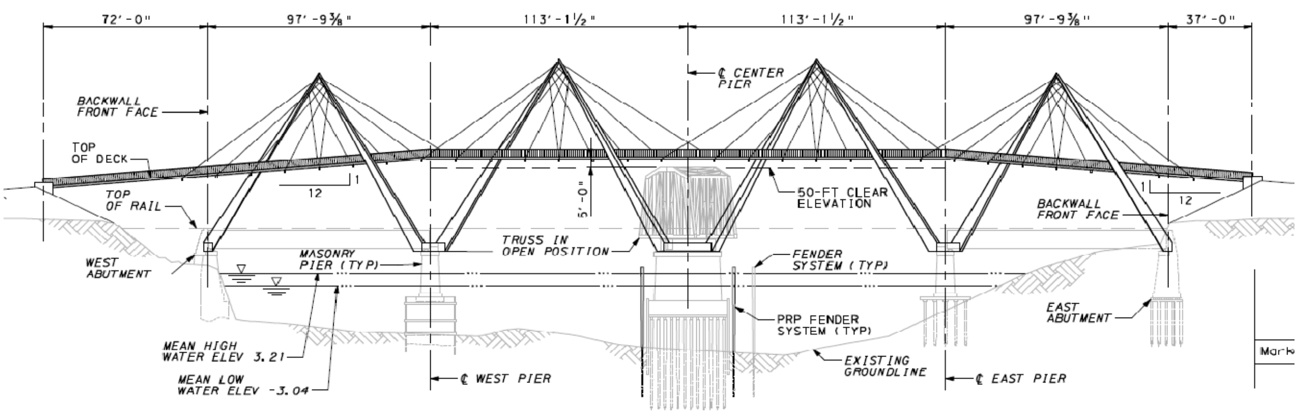
Project: **Grays Ferry Ave Ped Bridge** Index No:
Subject: **Summary of Preliminary Cost Estimates** Job No: **3061**
Designed by: **AL** Checked by:
Date: **July 8, 2010** Date:



4

$4,801,213

(Contech)
$4,471,919

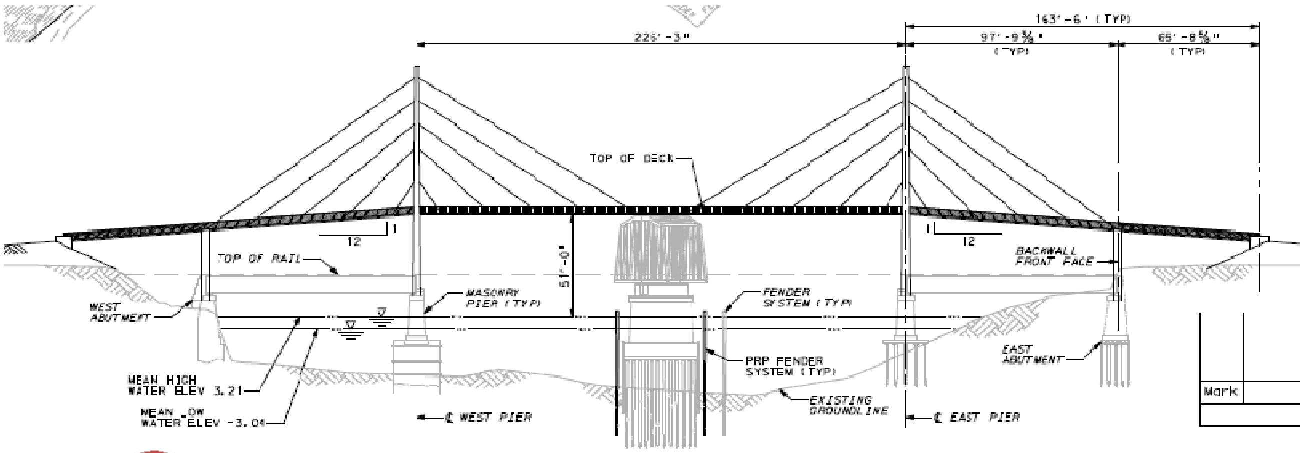


5

$6,398,132

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Summary of Preliminary Cost Estimates**	Job No:	**3061**
Designed by:	**AL**	Checked by:	
Date:	**July 8, 2010**	Date:	



6

$5,262,544

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Truss Concept-1 Preliminary Cost Estimate**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 19, 2010**	Date:	9/29/11

TRUSS CONCEPT - 1 COST ESTIMATE

New 2-Span Prefabricated Truss passing over existing rehabilitated truss

Item No.	Item	Unit	Quantity	Unit Price	Cost
0204-0100	Class 3 Excavation	CY	121	$45.00	$ 5,445
0205-0100	Foreign Borrow Excavation	CY	7920	$15.00	$ 118,800
1001-0001	Class A Concrete (Piers and Abutments)	CY	233	$650.00	$ 151,450
1001-0000	Class AAA Concrete (Deck)	CY	127	$1,100.00	$ 139,700
1002-0053	Reinforcement Bars, Epoxy Coated (Deck)	LBS	25400	$1.71	$ 43,434
1002-0053	Reinforcement Bars, Epoxy Coated (Substructure)	LBS	44070	$1.71	$ 75,360
1003-0008	Dowel Holes, 16" Depth	EA	132	$30.00	$ 3,960
1005-1143	HP 12x53 Steel Piles	LF	400	$91.20	$ 36,480
1018-0050	Removal of Existing Bridge	LS	1	$50,000.00	$ 50,000
9000-0001	Bridge Lighting	EA	40	$500.00	$ 20,000
9000-0002	Replace Fender System	LS	1	$853,153.72	$ 853,154
9000-0004	Remove and Reinstall Existing Truss	LS	1	$236,000.00	$ 236,000
9000-0005	Rehabilitation of Existing Stone Masonry Substructure	LF	4550	$50.00	$ 227,500
9000-0006	Underwater Rehabilitation of Substructure (Pressure Injection Grouting)	LS	1	$40,000.00	$ 40,000
9000-0007	Contech Truss	LS	1	$803,700.00	$ 803,700
9000-0010	Miscellaneous Steel Repairs	LS	1	$300,000.00	$ 300,000
9018-0001	Removal of Portion of Existing Bridge - Substructure	LS	1	$100,000.00	$ 100,000
9071-0151	Painting Existing Structural Steel Using Organic Zinc Coating Systems	SF	62230	$9.00	$ 560,070
9073-0002	Disposal of Bridge Waste	SF	62230	$0.30	$ 18,669
9075-0002	Containment	SF	62230	$3.00	$ 186,690
9077-0002	Worker Health and Safety	SF	62230	$0.50	$ 31,115

Sub-Total $ 4,001,526

Total with 15% Contingency $ 4,601,755

AMMANN & WHITNEY

Project: **Grays Ferry Ave Ped Bridge** Index No:
Subject: **Truss Concept-2 Preliminary Cost Estimate** Job No: **3061**
Designed by: **NER** Checked by: AL
Date: **May 19, 2010** Date: 9/29/11

TRUSS CONCEPT - 2 COST ESTIMATE
New Single-Span Prefabricated Truss passing over existing rehabilitated truss

Item No.	Item	Unit	Quantity	Unit Price	Cost
0204-0100	Class 3 Excavation	CY	121	$45.00	$ 5,445
0205-0100	Foreign Borrow Excavation	CY	7920	$15.00	$ 118,800
1001-0001	Class A Concrete (Piers and Abutments)	CY	163	$650.00	$ 105,950
1001-0000	Class AAA Concrete (Deck)	CY	127	$1,100.00	$ 139,700
1002-0053	Reinforcement Bars, Epoxy Coated (Deck)	LBS	25400	$1.71	$ 43,434
1002-0053	Reinforcement Bars, Epoxy Coated (Substructure)	LBS	30070	$1.71	$ 51,420
1003-0008	Dowel Holes, 16" Depth	EA	66	$30.00	$ 1,980
1005-1143	HP 12x53 Steel Piles	LF	400	$91.20	$ 36,480
1018-0050	Removal of Existing Bridge	LS	1	$50,000.00	$ 50,000
9000-0001	Bridge Lighting	EA	40	$500.00	$ 20,000
9000-0002	Replace Fender System	LS	1	$853,153.72	$ 853,154
9000-0005	Rehabilitation of Existing Stone Masonry Substructure	LF	4550	$50.00	$ 227,500
9000-0006	Underwater Rehabilitation of Substructure (Pressure Injection Grouting)	LS	1	$40,000.00	$ 40,000
9000-0007	Contech Truss	LS	1	$1,008,900.00	$ 1,008,900
9000-0010	Miscellaneous Steel Repairs	LS	1	$300,000.00	$ 300,000
9018-0001	Removal of Portion of Existing Bridge - Substructure	LS	1	$40,000.00	$ 40,000
9071-0151	Painting Existing Structural Steel Using Organic Zinc Coating Systems	SF	62230	$11.50	$ 715,645
9073-0002	Disposal of Bridge Waste	SF	62230	$0.30	$ 18,669
9075-0002	Containment	SF	62230	$3.50	$ 217,805
9077-0002	Worker Health and Safety	SF	62230	$0.50	$ 31,115

Sub-Total $ 4,025,996

Total with 15% Contingency $ 4,629,896

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Truss Concept-3 Preliminary Cost Estimate**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 19, 2010**	Date:	9/29/11

TRUSS CONCEPT - 3 COST ESTIMATE

Reuse existing truss with new prefabricated truss back spans

Item No.	Item	Unit	Quantity	Unit Price		Cost
0204-0100	Class 3 Excavation	CY	121	$45.00	$	5,445
0205-0100	Foreign Borrow Excavation	CY	1628	$15.00	$	24,420
1001-0001	Class A Concrete (Piers and Abutments)	CY	187	$650.00	$	121,550
1001-0000	Class AAA Concrete (Deck)	CY	127	$1,100.00	$	139,700
1002-0053	Reinforcement Bars, Epoxy Coated (Deck)	LBS	25400	$1.71	$	43,434
1002-0053	Reinforcement Bars, Epoxy Coated (Substructure)	LBS	34870	$1.71	$	59,628
1003-0008	Dowel Holes, 16" Depth	EA	132	$30.00	$	3,960
1005-1143	HP 12x53 Steel Piles	LF	400	$91.20	$	36,480
1018-0050	Removal of Existing Bridge	LS	1	$50,000.00	$	50,000
9000-0001	Bridge Lighting	EA	40	$500.00	$	20,000
9000-0002	Replace Fender System	LS	1	$467,310.00	$	467,310
9000-0004	Remove and Reinstall Existing Truss	LS	1	$236,000.00	$	236,000
9000-0005	Rehabilitation of Existing Stone Masonry Substructure	LF	4550	$50.00	$	227,500
9000-0006	Underwater Rehabilitation of Substructure (Pressure Injection Grouting)	LS	1	$40,000.00	$	40,000
9000-0007	Contech Truss	LS	1	$399,000.00	$	399,000
9000-0010	Miscellaneous Steel Repairs	LS	1	$300,000.00	$	300,000
9018-0001	Removal of Portion of Existing Bridge - Substructure	LS	1	$100,000.00	$	100,000
9071-0151	Painting Existing Structural Steel Using Organic Zinc Coating Systems	SF	60280	$9.00	$	542,520
9073-0002	Disposal of Bridge Waste	SF	60280	$0.30	$	18,084
9075-0002	Containment	SF	60280	$3.00	$	180,840
9077-0002	Worker Health and Safety	SF	60280	$0.50	$	30,140

Sub-Total $ 3,040,566

Total with 15% Contingency $ 3,496,651

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Cable-Stay Concept-1 Preliminary Cost Estimate**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 19, 2010**	Date:	9/29/11

CABLE-STAY CONCEPT - 1 COST ESTIMATE

Reuse existing truss with cable-stay back spans

Item No.	Item	Unit	Quantity	Unit Price		Cost
0204-0100	Class 3 Excavation	CY	121	$45.00	$	5,445
0205-0100	Foreign Borrow Excavation	CY	1628	$15.00	$	24,420
1001-0001	Class A Concrete (Piers and Abutments)	CY	222	$650.00	$	144,300
1001-0000	Class AAA Concrete (Deck)	CY	127	$1,100.00	$	139,700
1002-0053	Reinforcement Bars, Epoxy Coated (Deck)	LBS	25400	$1.71	$	43,434
1002-0053	Reinforcement Bars, Epoxy Coated (Substructure)	LBS	37937	$1.71	$	64,872
1003-0008	Dowel Holes, 16" Depth	EA	306	$30.00	$	9,180
1005-1143	HP 12x53 Steel Piles	LF	400	$91.20	$	36,480
1018-0050	Removal of Existing Bridge	LS	1	$50,000.00	$	50,000
9000-0001	Bridge Lighting	EA	40	$500.00	$	20,000
9000-0002	Replace Fender System	LS	1	$467,310.00	$	467,310
9000-0004	Remove and Reinstall Existing Truss	LS	1	$236,000.00	$	236,000
9000-0005	Rehabilitation of Existing Stone Masonry Substructure	LF	4550	$50.00	$	227,500
9000-0006	Underwater Rehabilitation of Substructure (Pressure Injection Grouting)	LS	1	$40,000.00	$	40,000
9000-0008	Bridge Railing	LF	1080	$130.00	$	140,400
9000-0009	Multistrand Stay-Cable System (4-Strands)		2827	$35.63	$	100,712
9000-0010	Miscellaneous Steel Repairs	LS	1	$300,000.00	$	300,000
9018-0001	Removal of Portion of Existing Bridge - Substructure	LS	1	$140,000.00	$	140,000
9050-0001	Fabricated Structural Steel, Floor System	LBS	49640	$5.70	$	282,948
9050-0002	Fabricated Structural Steel, Pylons	LBS	128380	$5.70	$	731,766
9071-0151	Painting Existing Structural Steel Using Organic Zinc Coating Systems	SF	62230	$9.00	$	560,070
9073-0002	Disposal of Bridge Waste	SF	62230	$0.30	$	18,669
9075-0002	Containment	SF	62230	$3.00	$	186,690
9077-0002	Worker Health and Safety	SF	62230	$0.50	$	31,115

Sub-Total	$	4,001,011
Total with 20% Contingency	$	4,801,213

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Cable-Stay Concept-1 (Contech)**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 19, 2010**	Date:	9/29/11

CABLE-STAY CONCEPT - 1 (CONTECH) COST ESTIMATE

Reuse existing truss with cable-stay back spans

Item No.	Item	Unit	Quantity	Unit Price	Cost
0204-0100	Class 3 Excavation	CY	121	$45.00	$ 5,445
0205-0100	Foreign Borrow Excavation	CY	1628	$15.00	$ 24,420
1001-0001	Class A Concrete (Piers and Abutments)	CY	222	$650.00	$ 144,300
1001-0000	Class AAA Concrete (Deck)	CY	127	$1,100.00	$ 139,700
1002-0053	Reinforcement Bars, Epoxy Coated (Deck)	LBS	25400	$1.50	$ 38,100
1002-0053	Reinforcement Bars, Epoxy Coated (Substructure)	LBS	37937	$1.50	$ 56,906
1003-0008	Dowel Holes, 16" Depth	EA	306	$30.00	$ 9,180
1005-1143	HP 12x53 Steel Piles	LF	400	$80.00	$ 32,000
1018-0050	Removal of Existing Bridge	LS	1	$50,000.00	$ 50,000
9000-0001	Bridge Lighting	EA	40	$500.00	$ 20,000
9000-0002	Replace Fender System	LS	1	$467,310.00	$ 467,310
9000-0004	Remove and Reinstall Existing Truss	LS	1	$236,000.00	$ 236,000
9000-0005	Rehabilitation of Existing Stone Masonry Substructure	LF	4550	$50.00	$ 227,500
9000-0008	Bridge Railing	LF	1080	$130.00	$ 140,400
9000-0006	Underwater Rehabilitation of Substructure (Pressure Injection Grouting)	LS	1	$40,000.00	$ 40,000
9000-0009	Contech Cable Stayed Bridge	LS	1	$889,200.00	$ 889,200
9000-0010	Miscellaneous Steel Repairs	LS	1	$300,000.00	$ 300,000
9018-0001	Removal of Portion of Existing Bridge - Substructure	LS	1	$140,000.00	$ 140,000
9071-0151	Painting Existing Structural Steel Using Organic Zinc Coating Systems	SF	60280	$9.00	$ 542,520
9073-0002	Disposal of Bridge Waste	SF	60280	$0.30	$ 18,084
9075-0002	Containment	SF	60280	$3.00	$ 180,840
9077-0002	Worker Health and Safety	SF	60280	$0.50	$ 30,140

Sub-Total $ 3,726,600

Total with 20% Contingency $ 4,471,919

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Cable-Stay Concept-2 Preliminary Cost Estimate**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 19, 2010**	Date:	9/29/11

CABLE-STAY CONCEPT - 2 COST ESTIMATE

Continuous spiral cable-stay spanning over existing truss

Item No.	Item	Unit	Quantity	Unit Price	Cost
0205-0100	Foreign Borrow Excavation	CY	7920	$15.00	$ 118,800
1001-0001	Class A Concrete (Piers and Abutments)	CY	140	$650.00	$ 91,000
1001-0000	Class AAA Concrete (Deck)	CY	127	$1,100.00	$ 139,700
1002-0053	Reinforcement Bars, Epoxy Coated (Deck)	LBS	25400	$1.71	$ 43,434
1002-0053	Reinforcement Bars, Epoxy Coated (Substructure)	LBS	12522	$1.71	$ 21,413
1003-0008	Dowel Holes, 16" Depth	EA	398	$30.00	$ 11,940
1005-1143	HP 12x53 Steel Piles	LF	400	$91.20	$ 36,480
1018-0050	Removal of Existing Bridge	LS	1	$50,000.00	$ 50,000
9000-0001	Bridge Lighting	EA	40	$500.00	$ 20,000
9000-0002	Replace Fender System	LS	1	$853,153.72	$ 853,154
9000-0004	Remove and Reinstall Existing Truss	LS	1	$236,000.00	$ 236,000
9000-0005	Rehabilitation of Existing Stone Masonry Substructure	LF	4550	$50.00	$ 227,500
9000-0006	Underwater Rehabilitation of Substructure (Pressure Injection Grouting)	LS	1	$40,000.00	$ 40,000
9000-0008	Bridge Railing	LF	1080	$130.00	$ 140,400
9000-0009	Multistrand Stay-Cable System (4-Strands)		7772	$35.63	$ 276,878
9000-0010	Miscellaneous Steel Repairs	LS	1	$300,000.00	$ 300,000
9018-0001	Removal of Portion of Existing Bridge - Substructure	LS	1	$140,000.00	$ 140,000
9050-0001	Fabricated Structural Steel, Pylons	LBS	231668	$5.70	$ 1,320,508
9050-0002	Fabricated Structural Steel, Floor System	LBS	82110	$5.70	$ 468,027
9071-0151	Painting Existing Structural Steel Using Organic Zinc Coating Systems	SF	62230	$9.00	$ 560,070
9073-0002	Disposal of Bridge Waste	SF	62230	$0.30	$ 18,669
9075-0002	Containment	SF	62230	$3.00	$ 186,690
9077-0002	Worker Health and Safety	SF	62230	$0.50	$ 31,115

Sub-Total	$ 5,331,776
Total with 20% Contingency	$ 6,398,132

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Cable-Stay Concept-3 Preliminary Cost Estimate**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 19, 2010**	Date:	9/29/11

CABLE-STAY CONCEPT - 3 COST ESTIMATE

Two tower cable stayed structure

Item No.	Item	Unit	Quantity	Unit Price		Cost
0204-0100	Class 3 Excavation	CY	121	$45.00	$	5,445
0205-0100	Foreign Borrow Excavation	CY	1628	$15.00	$	24,420
1001-0001	Class A Concrete (Piers and Abutments)	CY	163	$650.00	$	105,950
1001-0000	Class AAA Concrete (Deck)	CY	97	$1,100.00	$	106,700
1002-0053	Reinforcement Bars, Epoxy Coated (Deck)	LBS	19400	$1.71	$	33,174
1002-0053	Reinforcement Bars, Epoxy Coated (Substructure)	LBS	26621	$1.71	$	45,522
1003-0008	Dowel Holes, 16" Depth	EA	196	$30.00	$	5,880
1005-1143	HP 12x53 Steel Piles	LF	400	$91.20	$	36,480
1018-0050	Removal of Existing Bridge	LS	1	$50,000.00	$	50,000
9000-0001	Bridge Lighting	EA	40	$500.00	$	20,000
9000-0002	Replace Fender System	LS	1	$853,153.72	$	853,154
9000-0005	Rehabilitation of Existing Stone Masonry Substructure	LF	4550	$50.00	$	227,500
9000-0006	Underwater Rehabilitation of Substructure (Pressure Injection Grouting)	LS	1	$40,000.00	$	40,000
9000-0007	Contech Truss (Approach Spans)	LS	1	$171,000.00	$	171,000
9000-0008	Bridge Railing	LF	1080	$130.00	$	140,400
9000-0009	Multistrand Stay-Cable System (4-Strands)		2928	$35.63	$	104,310
9000-0010	Miscellaneous Steel Repairs	LS	1	$300,000.00	$	300,000
9018-0001	Removal of Portion of Existing Bridge - Substructure	LS	1	$80,000.00	$	80,000
9050-0001	Fabricated Structural Steel, Floor System	LBS	63618	$5.70	$	362,623
9050-0002	Fabricated Structural Steel, Pylons	LBS	153746	$5.70	$	876,352
9071-0151	Painting Existing Structural Steel Using Organic Zinc Coating Systems	SF	62230	$9.00	$	560,070
9073-0002	Disposal of Bridge Waste	SF	62230	$0.30	$	18,669
9075-0002	Containment	SF	62230	$3.00	$	186,690
9077-0002	Worker Health and Safety	SF	62230	$0.50	$	31,115
				Sub-Total	$	4,385,453
				Total with 20% Contingency	$	5,262,544

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Existing Truss Bridge Approximate Weight**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 6, 2010**	Date:	06/01/10

The following calculates the approximate weight of the existing truss in order to check the feasability of crane picking from a barge.

END BOTTOM CHORD (L0 - L1)
2 - C15 x 35 with Single Lacing (top and bottom)

Channel weight (2 channels)	w =	70	plf
Length (L0-L1)	L =	27.75	ft
Lattice bar length	Ll =	1.41	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.38	in
Length of lattice bar along bottom chord	L2 =	9.25	in
Weight of lattice per linear foot of bottom chord	W2 =	11.64	plf
Total weight of steel per linear foot of bottom chord		81.64	plf
Number of bottom chords	Nc =	4	
Total weight of L0-L1 Bottom Chord		**9062**	**lbs**

BOTTOM CHORD (L1 - L3)
2 - C15 x 50 with Single Lacing

Channel weight (2 channels)	w =	100	plf
Length (L1-L3)	L =	55.5	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.38	in
Length of lattice bar along bottom chord	L2 =	8	in
Weight of lattice per linear foot of bottom chord	W2 =	12.21	plf
Total weight of steel per linear foot of bottom chord		112.21	plf
Number of bottom chords	Nc =	4	
Total weight of L1-L3 Bottom Chord		**24911**	**lbs**

BOTTOM CHORD (L3 - L4)
2 - C15 x 50 with Single Lacing

Channel weight (2 channels)	w =	100	plf
Length (L3-L4)	L =	27.75	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.38	in
Length of lattice bar along bottom chord	L2 =	8	in
Weight of lattice per linear foot of bottom chord	W2 =	12.21	plf
Total weight of steel per linear foot of bottom chord		112.21	plf
Number of bottom chords	Nc =	4	
Total weight of L3-L4 Bottom Chord		**12456**	**lbs**

TOP CHORD (U1 - U3)
2 - C15 x 40 with Double Lacing

Channel weight (2 channels)	w =	80	plf
Length (U1-U3)	L =	55.5	ft
Lattice bar length	Ll =	2.50	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.44	in
Length of lattice bar along top chord	L2 =	18	in
Weight of lattice per linear foot of top chord	W2 =	24.81	plf
Total weight of steel per linear foot of top chord		104.81	plf
Number of top chords	Nc =	4	
Total weight of U1-U3 Top Chord		**23268**	**lbs**

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Existing Truss Bridge Approximate Weight**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 6, 2010**	Date:	06/01/10

TOP CHORD (U3 - U4)

2 - C15 x 50 with Double Lacing

Channel weight (2 channels)	w =	100	plf
Length (L3-U4)	L =	27.75	ft
Lattice bar length	Ll =	2.50	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.50	in
Length of lattice bar along bottom chord	L2 =	18	in
Weight of lattice per linear foot of top chord	W2 =	28.36	plf
Total weight of steel per linear foot of top chord		128.36	plf
Number of top chords	Nc =	4	
Total weight of U3-U4 Top Chord		**14248**	**lbs**

FLOORBEAM (F1 & F2)

Web depth	d =	50	in
Web Thickness	t =	0.5625	in
Weight of one flange angle (L6x6x9/16)	wa =	22	plf
Cover plate thickness	tc =	0.5	in
Cover plate width	wc =	14	in
Floorbeam Length	L =	15.77	ft
Weight of one floorbeam		3648	lbs
Number of F1 & F2 floorbeams	Nf =	6	
Total weight of F1 & F2 floorbeams		**21891**	**lbs**

FLOORBEAM (EF)

Web depth	d =	46	in
Web Thickness	t =	0.5625	in
Weight of one flange angle (L6x6x5/8)	wa =	24.3	plf
Floorbeam Length	L =	15.77	ft
Weight of one floorbeam		2921	lbs
Number of EF floorbeams	Nf =	2	
Total weight of EF floorbeams		**5843**	**lbs**

STRINGERS (S & S7)

Web depth	d =	39	in
Web Thickness	t =	0.50	in
Weight of one flange angle (L6x4x5/8)	wa =	20	plf
Stringer Length	L =	27.75	ft
Weight of one stringer		4061	lbs
Number of S & S7 stringers	Ns =	8	
Total weight of S & S7 stringers		**32491**	**lbs**

END STRINGERS (S1 & S2)

Web depth	d =	39	in
Web Thickness	t =	0.50	in
Weight of one flange angle (L6x4x5/8)	wa =	20	plf
Stringer Length	L =	27.75	ft
Weight of one stringer		4061	lbs
Number of S1 & S2 stringers	Ns =	4	
Total weight of S1 & S2 stringers		**16245**	**lbs**

CENTER STRINGERS (S3 - S6)

Web depth	d =	39	in
Web Thickness	t =	0.50	in
Weight of one flange angle (L6x4x5/8)	wa =	19.8	plf
Cover plate thickness	tc =	0.5625	in
Cover plate width	wc =	14	in
Stringer Length	L =	27.75	ft
Weight of one stringer		5526	lbs
Number of stringers	Ns =	4	
Total weight of S3 - S6 stringers		**22105**	**lbs**

STRINGER LATERALS *(L3.5x3x5/16)*

Weight of one angle (L3.5x3x5/16)	wa =	6.65	plf
Approximate length of laterals	La =	7.83	ft
Number of laterals	Na =	40	
Total weight of laterals		**2084**	**lbs**

BOTTOM TRUSS LATERALS (L1 - L6) (L5x3.5x1/2)

Weight of one angle (L5x3.5x1/2)	wa =	13.6	plf
Approximate length of laterals	La =	30.67	ft
Number of laterals	Na =	12	
Total weight of laterals		**5005**	**lbs**

BOTTOM TRUSS LATERALS (L7 - L9) (L5x3.5x1/2)

Weight of one angle (L5x3.5x1/2)	wa =	13.6	plf
Approximate length of laterals	La =	20.25	ft
Number of laterals	Na =	4	
Total weight of laterals		**1102**	**lbs**

BOTTOM TRUSS LATERALS (L10) (L5x3.5x1/2)

Weight of one angle (L5x3.5x1/2)	wa =	13.6	plf
Approximate length of laterals	La =	13.50	ft
Number of laterals	Na =	4	
Total surface area of laterals		**734**	**lbs**

END POSTS (L0-U1)

2 - C15 x 35 with Double Lacing one side & Cover Plate other side

Channel weight (2 channels)	w =	70	plf
Length (L0-U1)	L =	39.42	ft
Lattice bar length	Ll =	2.54	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.44	in
Length of lattice bar along post	L2 =	19	in
Width of cover plate	wc =	22	in
Thickness of cover plate	tc =	0.5	in
Weight of lattice and cover plate per linear foot of post	A2 =	61.33	plf
Total weight of steel per linear foot of post		131.33	plf
Number of bottom end posts	Nc =	4	
Total weight of L0-U1 end posts		**20706**	**lbs**

INTERMEDIATE END POSTS (L4-U3)

2 - Built-up channels (4-L3.5x3.5x5/8 & 18x5/8" web PL) with Double Lacing

Weight of one angle (L3.5x3.5x5/8)	wa =	12	plf

Channel web depth	dc =	18	in
Channel web thickness	tc =	0.625	in
Weight of built-up channels		124.56	plf
Length (L4-U3)	L =	42.00	ft
Lattice bar length	Ll =	2.67	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.44	in
Length of lattice bar along post	L2 =	20	in
Weight of lattice per linear foot of post	A2 =	23.82	plf
Total weight of steel per linear foot of post		148.38	plf
Number of intermediate end posts	Nc =	4	
Weight of tie plate 1		78.26	lbs
Weight of tie plate 2		58.70	lbs
Number of tie plates	Nt =	16	
Total weight of L0-U1 end posts		**27120**	**lbs**

INTERMEDIATE POSTS (U1-L1, U2-L2, U3-L3)

2 - C15x33 channels with Double Lacing

Channel weight (2 channels)	w =	66	plf
Average Length of posts	L =	29.10	ft
Lattice bar length	Ll =	1.23	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.38	in
Length of lattice bar along post	L2 =	6	in
Weight of lattice per linear foot of post	W2 =	31.37	plf
Total weight of steel per linear foot of post		97.37	plf
Number of intermediate posts	Nc =	12	
Total weight of L0-U1 end posts		**34006**	**lbs**

CENTER POSTS (L4-U4)

2 - C12x25 channels with Double Lacing

Channel weight (2 channels)	w =	50	plf
Length of posts	L =	29.98	ft
Lattice bar length	Ll =	2.06	ft
Lattice bar width	wl =	2.25	in
Lattice bar thickness	tl =	0.38	in
Length of lattice bar along post	L2 =	15	in
Weight of lattice per linear foot of post	W2 =	18.95	plf
Total weight of steel per linear foot of post		68.95	plf
Number of center posts	Nc =	2	
Total weight of L4-U4 center posts		**4134**	**lbs**

SUB POSTS (LM-UM)

2 - C12x25 channels with Double Lacing

Channel weight (2 channels)	w =	50	plf
Length of posts	L =	29.94	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.25	in
Lattice bar thickness	tl =	0.38	in
Length of lattice bar along post	L2 =	7.5	in
Weight of lattice per linear foot of post	W2 =	23.54	plf
Total weight of steel per linear foot of post		73.54	plf
Number of SUB posts	Nc =	4	
Total weight of LM-UM sub posts		**8807**	**lbs**

DIAGONALS (L1-U2)

2 - C15x33 channels with Double Lacing

Channel weight (2 channels)	w =	66	plf
Length of posts	L =	37.63	ft
Lattice bar length	Ll =	2.52	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.44	in
Length of lattice bar along diagonal	L2 =	18.75	in
Weight of lattice per linear foot of diagonal	W2 =	24.02	plf
Total weight of steel per linear foot of diagonal		90.02	plf
Number of L1-U2 diagonals	Nc =	4	
Total weight of L1-U2 diagonals		**13548**	**lbs**

DIAGONALS (L2-U3)

2 - C15x40 channels with Double Lacing

Channel weight (2 channels)	w =	80	plf
Length of posts	L =	39.06	ft
Lattice bar length	Ll =	2.52	ft
Lattice bar width	wl =	2.50	in
Lattice bar thickness	tl =	0.44	in
Length of lattice bar along diagonal	L2 =	18.75	in
Weight of lattice per linear foot of diagonal	W2 =	24.02	plf
Total weight of steel per linear foot of diagonal		104.02	plf
Number of L2-U3 diagonals	Nc =	4	
Total weight of L2-U3 diagonals		**16253**	**lbs**

SUB-STRUTS (L3-MC)

2 - C12x25 channels with Double Lacing

Channel weight (2 channels)	w =	50	plf
Length of posts	L =	18.68	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.25	in
Lattice bar thickness	tl =	0.38	in
Length of lattice bar along strut	L2 =	7.25	in
Weight of lattice per linear foot of strut	W2 =	24.35	plf
Total weight of steel per linear foot of strut		74.35	plf
Number of L3-MC struts	Nc =	4	
Total weight of L3-MC struts		**5555**	**lbs**

GIRDERS (G1 & G2)

Web depth	d =	30	in
Web thickness	t =	0.375	in
Weight of one flange angle (L3.5x3x5/16)	wa =	6.65	plf
Girder Length	L =	15.88	ft
Weight of one girder		1030	lbs
Number of girders	Ng =	3	
Total weight of G1 & G2 girders		**3090**	**lbs**

END PORTALS (P10)

Top Angle (2 - L5x3.5x7/16; LLH)

Top Angle weight	w1 =	11.9	plf
Top angle length	L1 =	18.83	ft
Total weight of top angle	W1 =	448.23	lbs

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Existing Truss Bridge Approximate Weight**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 6, 2010**	Date:	06/01/10

Bottom Angle (2 - L5x3.5x7/16; LLH)

Bottom Angle weight	w2 =	11.9	plf
Bottom angle length	L2 =	15.06	ft
Total weight of bottom angle	W2 =	358.49	lbs

Interior Angles (L3.5x3.5x3/8)

Interior Angle weight	w3 =	9.74	plf
Total interior angle length	L3 =	63.83	ft
Total weight of interior angles	W3 =	621.74	lbs

Number of P10 portals	Np =	2	
Total weight of P10 portals		**2856.92**	**lbs**

SWAY FRAMES (F)

Top Angle (2 - L5x3.5x7/16; LLH)

Top Angle weight	w1 =	11.9	plf
Top angle length	L1 =	18.83	ft
Total weight of top angle	W1 =	448.23	lbs

Bottom Angle (2 - L5x3.5x7/16; LLH)

Bottom Angle weight	w2 =	11.9	plf
Bottom angle length	L2 =	15.25	ft
Total weight of bottom angle	W2 =	362.95	lbs

Interior Angles (L3.5x3.5x3/8)

Interior Angle weight	w3 =	9.74	plf
Total interior angle length	L3 =	68.50	ft
Total weight of interior angles	W3 =	667.19	lbs

Number of F sway frames	Np =	2	
Total weight of F sway frames		**2956.75**	**lbs**

CENTER PORTALS

Top Angle (2 - L5x3.5x7/16; LLH)

Top Angle weight	w1 =	11.9	plf
Top angle length	L1 =	18.83	ft
Total weight of top angle	W1 =	448.23	lbs

Bottom Angle (2 - L5x3.5x7/16; LLH)

Bottom Angle weight	w2 =	11.9	plf
Bottom angle length	L2 =	15.57	ft
Total weight of bottom angle	W2 =	370.64	lbs

Interior Angles (L3.5x3.5x3/8) & k-brace (2 - L3.5x3.5x3/8)

Interior Angle weight	w3 =	9.74	plf
Total interior angle length	L3 =	130.50	ft
Total weight of interior angles	W3 =	1271.07	lbs

Number of center portals	Np =	2	
Total weight of center portals		**4179.88**	**lbs**

TOP LATERALS (T1-T3)

4 - L3x3.5x5/16 (LLH) with Double Lacing

Weight of one angle	wa =	6.65	plf
Lattice bar length	Ll =	1.57	ft
Lattice bar width	wl =	2.25	in

Lattice bar thickness	tl =	0.38	in
Length of lattice bar along lateral	L2 =	11.5	in
Weight of lattice per linear foot of lateral	W2 =	18.85	plf
Total weight of steel per linear foot of lateral		45.45	plf
Number of laterals	Nc =	8	
Approximate length of top laterals		29.5	ft
Total surface area of T1-T3 top laterals		**10726.05**	**lbs**

STAIR FRAME (SF1)

2-C3x13.75 frames with C7x12.25 treads

Weight of one C8x13.75	wc1 =	13.75	plf
Length of C8x13.75	Lf =	38.86	ft
Weight of one of C7x12.25	wc2 =	12.25	plf
Length of one tread	Lt =	1.99	ft
Number of treads	Nt =	12	
Total weight of SF1 frame and treads		**1361.24**	**lbs**

STAIR FRAME (SF2)

2-C3x13.75 frames with C7x12.25 treads

Weight of one C8x13.75	wc1 =	13.75	plf
Length of C8x13.75	Lf =	55.21	ft
Weight of one C7x12.25	wc2 =	12.25	plf
Length of one tread	Lt =	1.99	ft
Number of treads	Nt =	24	
Total weight of SF1 frame and treads		**2103.17**	**lbs**

SUB TOTAL OF WEIGHT OF STEEL — 348847 LBS

ADD 15% FOR GUSSETS, PLATES, RIVETS, MISC. BRACKETS, STIFFENERS, ETC.

TOTAL WEIGHT OF STEEL TO LIFT ABOVE BOTTOM CHORD — 401180 LBS

ADDITIONAL WEIGHT OF TRUSS BELOW BOTTOM CHORD

The following is the calculation of the additional weight of the steel members below the bottom chord since the truss may be lifted with or without these additional members.

WHEEL GIRDER (WG1)

Web depth of constant web depth portion	dc =	60.5	in
Length of constant web depth portion	Lc =	6.5	ft
Average web depth of variable web depth portion	dv =	35.875	in
Length of variable depth portion	Lv =	11.625	ft
Web thickness	t =	0.375	in
Weight of one top flange angle (L6x4x3/8)	wta =	12.20	plf
Total girder length	L =	18.13	ft
Weight on one bottom flange angle (L4x4x3/8)	wba =	9.72	plf
Length of bottom flange angle		22.00	ft
Total weight of WG1 girder		**1903.90**	**lbs**

WHEEL GIRDER (WG2)

Web depth	d =	18	in
Web thickness	t =	0.375	in
Weight of one top flange angle (L4x4x1/2)	wta =	12.7	plf
Weight of one bottom flange angle (L6x4x1/2)	wba =	16	plf
Girder Length	L =	12.13	ft
Weight of one girder		974.47	lbs
Number of WG2 girders	Ng =	4	
Total weight of WG2 girders		**3897.88**	**lbs**

PINION GIRDER (PG)

Web depth of constant web depth portion	dc =	68.5	in
Length of constant web depth portion	Lc =	6.5	ft
Average web depth of variable web depth portion	dv =	40	in
Length of variable depth portion	Lv =	11.625	ft
Web thickness	t =	0.375	in
Weight of one top flange angle (L6x4x3/8)	wta =	12.20	plf
Total girder length	L =	18.13	ft
Weight on one bottom flange angle (L4x4x3/8)	wba =	9.72	plf
Length of bottom flange angle		23.00	ft
Total weight of WG1 girder		**2050.89**	**lbs**

CENTER GIRDERS (CG1 & CG2)

Web depth	d =	60	in
Web thickness	t =	0.625	in
Weight of one flange angle (L6x6x1/2)	wa =	19.6	plf
Cover plate thickness	tc =	0.5	in
Cover plate width	wc =	14	in
Average Girder Length	L =	21.79	ft
Weight of one girder		5008.20	lbs
Number of CG girders	Ng =	2	
Total weight of WG2 girders		**10016.40**	**lbs**

WEDGE GIRDERS

Web depth	d =	48.5	in
Web thickness	t =	0.375	in
Weight of one flange angle (L6x4x3/8)	wa =	12.20	plf
Girder Length	L =	4.50	ft

Weight of one girder		498.10	lbs
Number of wedge girders	Ng =	4	
Total weight of WG2 girders		**1992.38**	**lbs**

BOLT GIRDERS

Web depth	d =	39.75	in
Web thickness	t =	0.5	in
Weight of one flange angle (L6x4x3/8)	wa =	12.20	plf
Girder Length	L =	4.50	ft
Weight of one girder		523.94	lbs
Number of wedge girders	Ng =	2	
Total weight of WG2 girders		**1047.87**	**lbs**

TOTAL ADDITIONAL WEIGHT OF STEEL BELOW BOTTOM CHORD	20909	LBS
ADD 15% FOR MISC. MACHINERY CONNECTIONS, PLATES, ETC.	3136	LBS

TOTAL LBS OF STEEL TO LIFT ABOVE & BELOW BOTTOM CHORD	**425230**	**LBS**

AMMANN & WHITNEY

Project:	Grays Ferry Ave Ped Bridge	Index No:	
Subject:	Existing Truss Bridge Rehab Quantities	Job No:	3061
Designed by:	NER	Checked by:	AL
Date:	May 6, 2010	Date:	5/17/10

The following calculates the approximate total square feet of steel of the existing steel truss to be painted for rehabilitation. See existing plans for member designations.

END BOTTOM CHORD (L0 - L1)
2 - C15 x 35 with Single Lacing (top and bottom)

Channel depth	d =	15	in
Channel flange width	b =	3.42	in
Length (L0-L1)	L =	27.75	ft
Perimeter of one channel	Pc =	3.64	ft
Lattice bar length	Ll =	1.41	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	0.586	sf
Length of lattice bar along bottom chord	L2 =	9.25	in
Area of lattice per linear foot of bottom chord	A2 =	1.52	sf/ft
Total surface area of steel per linear foot of bottom chord		8.80	sf/ft
Number of bottom chords	Nc =	4	
Total surface area of L0-L1 Bottom Chord		**976.83**	**sf**

BOTTOM CHORD (L1 - L3)
2 - C15 x 50 with Single Lacing

Channel depth	d =	15	in
Channel flange width	b =	3.72	in
Length (L1-L3)	L =	55.5	ft
Perimeter of one channel	Pc =	3.74	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	0.532	sf
Length of lattice bar along bottom chord	L2 =	8	in
Area of lattice per linear foot of bottom chord	A2 =	1.60	sf/ft
Total surface area of steel per linear foot of bottom chord		9.08	sf/ft
Number of bottom chords	Nc =	4	
Total surface area of L1-L3 Bottom Chord		**2014.66**	**sf**

BOTTOM CHORD (L3 - L4)
2 - C15 x 50 with Single Lacing

Channel depth	d =	15	in
Channel flange width	b =	3.72	in
Length (L3-L4)	L =	27.75	ft
Perimeter of one channel	Pc =	3.74	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	0.532	sf
Length of lattice bar along bottom chord	L2 =	8	in
Area of lattice per linear foot of bottom chord	A2 =	1.60	sf/ft
Total surface area of steel per linear foot of bottom chord		9.08	sf/ft
Number of bottom chords	Nc =	4	
Total surface area of L3-L4 Bottom Chord		**1007.33**	**sf**

TOP CHORD (U1 - U3)
2 - C15 x 40 with Double Lacing

Channel depth	d =	15	in
Channel flange width	b =	3.52	in
Length (U1-U3)	L =	55.5	ft
Perimeter of one channel	Pc =	3.67	ft
Lattice bar length	Ll =	2.50	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	1.042	sf
Length of lattice bar along bottom chord	L2 =	18	in
Area of lattice per linear foot of bottom chord	A2 =	2.78	sf/ft
Total surface area of steel per linear foot of bottom chord		10.12	sf/ft
Number of bottom chords	Nc =	4	
Total surface area of U1-U3 Top Chord		**2247.63**	**sf**

TOP CHORD (U3 - U4)
2 - C15 x 50 with Double Lacing

Channel depth	d =	15	in
Channel flange width	b =	3.72	in
Length (L3-U4)	L =	27.75	ft
Perimeter of one channel	Pc =	3.74	ft
Lattice bar length	Ll =	2.50	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	1.042	sf
Length of lattice bar along bottom chord	L2 =	18	in
Area of lattice per linear foot of bottom chord	A2 =	2.78	sf/ft
Total surface area of steel per linear foot of bottom chord		10.26	sf/ft
Number of bottom chords	Nc =	4	
Total surface area of U3-U4 Top Chord		**1138.61**	**sf**

FLOORBEAM (F1 & F2)

Web depth	d =	50	in
Flange width	b =	14	in
Floorbeam Length	L =	15.77	ft
Surface Area of one floorbeam		205.02	sf
Number of F1 & F2 floorbeams	Nf =	6	
Total surface area of F1 & F2 floorbeams		**1230.13**	**sf**

FLOORBEAM (EF)

Web depth	d =	46	in
Flange width	b =	12.56	in
Floorbeam Length	L =	15.77	ft
Surface Area of one floorbeam		186.95	sf
Number of F1 & F2 floorbeams	Nf =	2	
Total surface area of F1 & F2 floorbeams		**373.90**	**sf**

STRINGERS (S & S7)

Web depth	d =	39	in
Flange width	b =	14	in
Stringer Length	L =	27.75	ft
Surface Area of one stringer		309.88	sf
Number of S & S7 stringers	Ns =	8	
Total surface area of S & S7 stringers		**2479.00**	**sf**

END STRINGERS (S1 & S2)

Web depth	d =	39	in
Flange width	b =	14	in
Stringer Length	L =	27.75	ft
Surface Area of one stringer		309.88	sf
Number of S1 & S2 stringers	Ns =	4	
Total surface area of S1 & S2 stringers		**1239.50**	**sf**

CENTER STRINGERS (S3 - S6)

Web depth	d =	39	in
Flange width	b =	14	in
Stringer Length	L =	27.75	ft
Surface Area of one stringer		309.88	sf
Number of stringers	Ns =	4	
Total surface area of S3 - S6 stringers		**1239.50**	**sf**

STRINGER LATERALS *(L3.5x3x5/16)*

Length of first angle leg	L1 =	3.5	in
Length of second angle leg	L2 =	3	in
Perimeter of angle	Pa =	1.083	ft
Approximate length of laterals	La =	7.83	ft
Number of laterals	Na =	40	
Total surface area of laterals		**339.44**	**sf**

BOTTOM TRUSS LATERALS (L1 - L6) (L5x3.5x1/2)

Length of first angle leg	L1 =	5	in
Length of second angle leg	L2 =	3.5	in
Perimeter of angle	Pa =	2.250	ft
Approximate length of laterals	La =	30.67	ft
Number of laterals	Na =	12	
Total surface area of laterals		**828.09**	**sf**

BOTTOM TRUSS LATERALS (L7 - L9) (L5x3.5x1/2)

Length of first angle leg	L1 =	5	in
Length of second angle leg	L2 =	3.5	in
Perimeter of angle	Pa =	2.250	ft
Approximate length of laterals	La =	20.25	ft
Number of laterals	Na =	4	
Total surface area of laterals		**182.25**	**sf**

BOTTOM TRUSS LATERALS (L10) (L5x3.5x1/2)

Length of first angle leg	L1 =	5	in
Length of second angle leg	L2 =	3.5	in
Perimeter of angle	Pa =	2.250	ft
Approximate length of laterals	La =	13.50	ft
Number of laterals	Na =	4	
Total surface area of laterals		**121.50**	**sf**

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**Existing Truss Bridge Rehab Quantities**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 6, 2010**	Date:	5/17/10

END POSTS (L0-U1)

2 - C15 x 35 with Double Lacing one side & Cover Plate other side

Channel depth	d =	15	in
Channel flange width	b =	3.42	in
Length (L0-U1)	L =	39.42	ft
Perimeter of one channel	Pc =	3.64	ft
Lattice bar length	Ll =	2.54	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	1.059	sf
Length of lattice bar along post	L2 =	19	in
Area of lattice and cover plate per linear foot of post	A2 =	3.17	sf/ft
Total surface area of steel per linear foot of post		10.45	sf/ft
Number of bottom end posts	Nc =	4	
Total surface area of L0-U1 end posts		**1647.78**	**sf**

INTERMEDIATE END POSTS (L4-U3)

2 - Built-up channels with Double Lacing

Channel depth	d =	18.5	in
Channel flange width	b =	4.125	in
Length (L4-U3)	L =	42.00	ft
Perimeter of one channel	Pc =	4.46	ft
Lattice bar length	Ll =	2.67	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	1.111	sf
Length of lattice bar along post	L2 =	20	in
Area of lattice per linear foot of post	A2 =	2.67	sf/ft
Total surface area of steel per linear foot of post		11.58	sf/ft
Number of intermediate end posts	Nc =	4	
Total surface area of L0-U1 end posts		**1946.00**	**sf**

INTERMEDIATE POSTS (U1-L1, U2-L2, U3-L3)

2 - C15x33 channels with Double Lacing

Channel depth	d =	15	in
Channel flange width	b =	3.4	in
Average Length of posts	L =	29.10	ft
Perimeter of one channel	Pc =	3.63	ft
Lattice bar length	Ll =	1.23	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	0.512	sf
Length of lattice bar along post	L2 =	6	in
Area of lattice per linear foot of post	A2 =	4.10	sf/ft
Total surface area of steel per linear foot of post		11.36	sf/ft
Number of intermediate posts	Nc =	12	
Total surface area of L0-U1 end posts		**3968.84**	**sf**

CENTER POSTS (L4-U4)

2 - C12x25 channels with Double Lacing

Channel depth	d =	12	in
Channel flange width	b =	3.05	in
Length of posts	L =	29.98	ft
Perimeter of one channel	Pc =	3.02	ft
Lattice bar length	Ll =	2.06	ft
Lattice bar width	wl =	2.25	in
Surface area of one lattice bar	Al =	0.773	sf

Length of lattice bar along post	L2 =	15	in
Area of lattice per linear foot of post	A2 =	2.48	sf/ft
Total surface area of steel per linear foot of post		8.51	sf/ft
Number of center posts	Nc =	2	
Total surface area of L4-U4 center posts		**510.15**	**sf**

SUB POSTS (LM-UM)

2 - C12x25 channels with Double Lacing

Channel depth	d =	12	in
Channel flange width	b =	3.05	in
Length of posts	L =	29.94	ft
Perimeter of one channel	Pc =	3.02	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.25	in
Surface area of one lattice bar	Al =	0.480	sf
Length of lattice bar along post	L2 =	7.5	in
Area of lattice per linear foot of post	A2 =	3.08	sf/ft
Total surface area of steel per linear foot of post		9.11	sf/ft
Number of SUB posts	Nc =	4	
Total surface area of LM-UM sub posts		**1090.72**	**sf**

DIAGONALS (L1-U2)

2 - C15x33 channels with Double Lacing

Channel depth	d =	15	in
Channel flange width	b =	3.40	in
Length of posts	L =	37.63	ft
Perimeter of one channel	Pc =	3.63	ft
Lattice bar length	Ll =	2.52	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	1.050	sf
Length of lattice bar along diagonal	L2 =	18.75	in
Area of lattice per linear foot of diagonal	A2 =	2.69	sf/ft
Total surface area of steel per linear foot of diagonal		9.96	sf/ft
Number of L1-U2 diagonals	Nc =	4	
Total surface area of L1-U2 diagonals		**1498.31**	**sf**

DIAGONALS (L2-U3)

2 - C15x40 channels with Double Lacing

Channel depth	d =	15	in
Channel flange width	b =	3.52	in
Length of posts	L =	39.06	ft
Perimeter of one channel	Pc =	3.67	ft
Lattice bar length	Ll =	2.52	ft
Lattice bar width	wl =	2.50	in
Surface area of one lattice bar	Al =	1.050	sf
Length of lattice bar along diagonal	L2 =	18.75	in
Area of lattice per linear foot of diagonal	A2 =	2.69	sf/ft
Total surface area of steel per linear foot of diagonal		10.04	sf/ft
Number of L2-U3 diagonals	Nc =	4	
Total surface area of L2-U3 diagonals		**1568.06**	**sf**

SUB-STRUTS (L3-MC)

2 - C12x25 channels with Double Lacing

Channel depth	d =	12	in

Channel flange width	b =	3.05	in
Length of posts	L =	18.68	ft
Perimeter of one channel	Pc =	3.02	ft
Lattice bar length	Ll =	1.28	ft
Lattice bar width	wl =	2.25	in
Surface area of one lattice bar	Al =	0.480	sf
Length of lattice bar along strut	L2 =	7.25	in
Area of lattice per linear foot of strut	A2 =	3.18	sf/ft
Total surface area of steel per linear foot of strut		9.21	sf/ft
Number of L3-MC struts	Nc =	4	
Total surface area of L3-MC struts		**688.39**	**sf**

GIRDERS (G1 & G2)

Web depth	d =	30	in
Flange width	b =	7.5	in
Girder Length	L =	15.88	ft
Surface Area of one girder		119.06	sf
Number of girders	Ng =	3	
Total surface area of S3 - S6 stringers		**357.19**	**sf**

END PORTALS (P10)

Top Angle (2 - L5x3.5x7/16; LLH)

Top Angle perimeter	P1 =	27	in
Top angle length	L1 =	18.83	ft
Surface Area of top angle	A1 =	508.50	sf

Bottom Angle (2 - L5x3.5x7/16; LLH)

Bottom Angle perimeter	P2 =	27	in
Bottom angle length	L2 =	15.06	ft
Surface Area of bottom angle	A2 =	406.69	sf

Interior Angles (L3.5x3.5x3/8)

Interior Angle perimeter	P3 =	14	in
Total interior angle length	L3 =	63.83	ft
Surface Area of interior angles	A3 =	893.67	sf

Number of P10 portals	Np =	2	
Total surface area of P10 portals		**3617.71**	**sf**

SWAY FRAMES (F)

Top Angle (2 - L5x3.5x7/16; LLH)

Top Angle perimeter	P1 =	27	in
Top angle length	L1 =	18.83	ft
Surface Area of top angle	A1 =	508.50	sf

Bottom Angle (2 - L5x3.5x7/16; LLH)

Bottom Angle perimeter	P2 =	27	in
Bottom angle length	L2 =	15.25	ft
Surface Area of bottom angle	A2 =	411.75	sf

Interior Angles (L3.5x3.5x3/8)

Interior Angle perimeter	P3 =	14	in
Total interior angle length	L3 =	68.50	ft
Surface Area of interior angles	A3 =	959.00	sf

Number of F sway frames	Np =	2	
Total surface area of F sway frames		**3758.50**	**sf**

CENTER PORTALS

Top Angle (2 - L5x3.5x7/16; LLH)

Top Angle perimeter	P1 =	27	in
Top angle length	L1 =	18.83	ft
Surface Area of top angle	A1 =	508.50	sf

Bottom Angle (2 - L5x3.5x7/16; LLH)

Bottom Angle perimeter	P2 =	27	in
Bottom angle length	L2 =	15.57	ft
Surface Area of bottom angle	A2 =	420.47	sf

Interior Angles (L3.5x3.5x3/8) & k-brace (2 - L3.5x3.5x3/8)

Interior Angle perimeter	P3 =	14	in
Total interior angle length	L3 =	130.50	ft
Surface Area of interior angles	A3 =	1827.00	sf

Number of center portals	Np =	2	
Total surface area of center portals		**5511.94**	**sf**

TOP LATERALS (T1-T3)

4 - L3x3.5x5/16 (LLH) with Double Lacing

Flange angle perimeter	Ap =	40	in
Lattice bar length	Ll =	1.57	ft
Lattice bar width	wl =	2.25	in
Surface area of one lattice bar	Al =	0.590	sf
Length of lattice bar along lateral	L2 =	11.5	in
Area of lattice per linear foot of lateral	A2 =	2.46	sf/ft
Total surface area of steel per linear foot of lateral		5.80	sf/ft
Number of laterals	Nc =	8	
Approximate length of top laterals		29.5	ft
Total surface area of T1-T3 top laterals		**1367.69**	**sf**

STAIR FRAME (SF1) and PLATFORM (SP1)

2-C8x13.75 frames with C7x12.25 treads

Perimeter of C8x13.75	Pf =	25.36	in
Length of C8x13.75	Lf =	38.86	ft
Surface area of frames	Af =	82.134	sf
Surface area of platform	Ap =	10.36	sf
Perimeter of C7x12.25	Pt =	22.76	in
Length of one tread	Lt =	1.99	ft
Number of treads	Nt =	12	
Surface area of treads	At =	45.283	sf
Nominal surface area for brackets	Ab =	5.0	sf
Total surface area of SF1 frame and treads and SP1 platform and brackets		**142.78**	**sf**

STAIR FRAME (SF2) and PLATFORM (SP2)

2-C8x13.75 frames with C7x12.25 treads

Perimeter of C8x13.75	Pf =	25.36	in
Length of C8x13.75	Lf =	55.21	ft
Surface area of frames	Af =	116.674	sf
Surface area of platform	Ap =	31.31	sf
Perimeter of C7x12.25	Pt =	22.76	in
Length of one tread	Lt =	1.99	ft

Number of treads	Nt =	24	
Surface area of treads	At =	90.566	sf
Nominal surface area for brackets	Ab =	10.0	sf
Total surface area of SF2 frame and treads and SP2 platform and brackets		**248.55**	**sf**

SUB TOTAL OF SURFACE AREA OF STEEL	52414	SF
ADD 15% FOR GUSSETS, PLATES, CONNECTIONS, ETC.		

TOTAL SF OF STEEL TO REHAB ABOVE BOTTOM CHORD	**60280**	**SF**

AMMANN & WHITNEY			
Project:	Grays Ferry Ave Ped Bridge	Index No:	
Subject:	Existing Truss Bridge Rehab Quantities	Job No:	3061
Designed by:	NER	Checked by:	AL
Date:	May 6, 2010	Date:	6/7/10

ADDITIONAL SURFACE AREA REHAB IF TRUSS STAYS IN ORIGINAL POSITION

The following is the calculation of the additional surface area of the steel members below the bottom chord that will need to be rehabilitated if the truss is to stay in place.

WHEEL GIRDER (WG1)

Web depth of constant web depth portion	dc =	60.5	in
Length of constant web depth portion	Lc =	6.5	ft
Average web depth of variable web depth portion	dv =	35.875	in
Length of variable depth portion	Lv =	11.625	ft
Flange width	b =	12.03	in
Total girder length	L =	20.06	ft
Total surface area of WG1 girder		**215.51**	**sf**

WHEEL GIRDER (WG2)

Web depth	d =	18	in
Flange width	b =	12.375	in
Girder Length	L =	12.13	ft
Surface Area of one girder		86.39	sf
Number of WG2 girders	Ng =	4	
Total surface area of WG2 girders		**345.56**	**sf**

PINION GIRDER (PG)

Web depth of constant web depth portion	dc =	68.5	in
Length of constant web depth portion	Lc =	6.5	ft
Average web depth of variable web depth portion	dv =	40	in
Length of variable depth portion	Lv =	11.625	ft
Flange width	b =	12.03	in
Total girder length	L =	18.13	ft
Total surface area of WG1 girder		**224.40**	**sf**

CENTER GIRDERS (CG1 & CG2)

Web depth	d =	60	in
Flange width	b =	14	in
Average Girder Length	L =	21.79	ft
Surface Area of one girder		319.61	sf
Number of CG girders	Ng =	2	
Total surface area of WG2 girders		**639.22**	**sf**

WEDGE GIRDERS

Web depth	d =	48.5	in
Flange width	b =	9	in
Girder Length	L =	4.50	ft
Surface Area of one girder		49.88	sf
Number of wedge girders	Ng =	4	
Total surface area of WG2 girders		**199.50**	**sf**

BOLT GIRDERS

Web depth	d =	39.75
Flange width	b =	14
Girder Length	L =	4.50
Surface Area of one girder		50.81
Number of wedge girders	Ng =	2
Total surface area of WG2 girders		**101.63**

TOTAL ADDITIONAL SF OF STEEL BELOW BOTTOM CHORD	1688	SF
ADD 15% FOR MISC. MACHINERY CONNECTIONS, PLATES, ETC.	253	SF
TOTAL SF OF STEEL TO REHAB ABOVE & BELOW BOTTOM CHORD	**62230**	**SF**

AMMANN & WHITNEY

Project:	Grays Ferry Ave Ped Bridge	Index No:	
Subject:	Masonry Pier & Abutment Rehabilitation	Job No:	3061
Designed by:	NER	Checked by:	AL
Date:	May 6, 2010	Date:	05/18/10

The following calculates the approximate total linear feet of Masonry Repointing for the substructures. The stone is assumed to be approximately 2'H x 3'W based on photos. Mean low water is approximately at the

PIERS (EAST & WEST)

Height of stone portion of pier	20.00	ft
Perimeter of pier (approximate average due to batter)	56.26	ft
Approximate height of single stone unit	2.00	ft
Approximate width of single stone unit	5.50	ft
Total LF of vertical repointing	220.00	ft
Total LF of horizontalal repointing	562.64	ft
Total LF of repointing for East & West Pier	1566	ft

CENTER PIER

Height of stone portion of pier	23.00	ft
Perimeter of pier (approximate average due to batter)	90.71	ft
Approximate height of single stone unit	2.00	ft
Approximate width of single stone unit	5.50	ft
Total LF of vertical repointing	391.00	ft
Total LF of horizontalal repointing	1088.56	ft
Total LF of repointing for Center Pier	1480	ft

EAST ABUTMENT

Approximate height of exposed stone portion of abutment	11.00	ft
Perimeter of exposed abutment (approximate due to limited existing plan info)	18.00	ft
Approximate height of single stone unit	2.00	ft
Approximate width of single stone unit	5.50	ft
Total LF of vertical repointing	44.00	ft
Total LF of horizontalal repointing	108.00	ft
Total LF of repointing for East Abutment	152	ft

WEST ABUTMENT

Approximate height of exposed stone portion of abutment	30.00	ft
Perimeter of exposed F.F. of abutment (approx. due to limited existing plan info)	44.00	ft
Perimeter of exposed F.F. of wingwalls (approx. due to limited existing plan info)	22.00	ft
Approximate height of single stone unit	2.00	ft
Approximate width of single stone unit	5.50	ft
Total LF of vertical repointing	360.00	ft
Total LF of horizontalal repointing	990.00	ft
Total LF of repointing for West Abutment	1350	ft

TOTAL LF OF REPOINTING **4550 FT**

Project:	Grays Ferry Ave Ped Bridge	Index No:	
Subject:	Masonry Pier & Abutment Rehabilitation	Job No:	3061
Designed by:	NER	Checked by:	AL
Date:	May 6, 2010	Date:	05/18/10

The following is a rough approximation for underwater concrete repair. There has been no underwater inspection to assess the current condition of the concrete so there is no accurate measurement of required repair at this point.

Approx. underwater concrete repair for West Pier	0.25	cy
Approx. underwater concrete repair for East Pier	0.25	cy
Approx. underwater concrete repair for Center Pier	0.50	cy

TOTAL UNDERWATER CONCRETE REPAIR $\boxed{1}$ **CY**

The following calculates the approximate total CY of foreign borrow excavation for building the approach embankments

FILL REQUIRED FOR TRUSS CONCEPTS 1 & 2 AND CABLE STAY CONCEPT 2

WEST EMBANKMENT

Existing ground elevation near abutment	E1 =	28.00	
Approximate maximum fill elevation near abutment	E2 =	44.00	
Approximate width of west abutment (2 ft greater than super structure width)	w =	14.00	ft
Horizontal component of slope of fill in front of abutment	xf =	2.00	
Base width of soil wedge = (E2-E1)*xf	bf =	32.00	ft
Fill required in front of abutment = 0.5*b*(E2-E1)*w	ff =	3584	cf
Horizontal component of slope of fill in back of abutment	xb =	12.00	
Base width of soil wedge = (E2-E1)*xb	bb =	192.00	ft
Fill required in front of abutment = 0.5*bb*(E2-E1)*w	fb =	21504	cf
Average height of soil wedges on side of abutment = (E2-E1)/2	hs =	8.00	ft
Fill required on side of abutment = 2*0.5*hs*(bf+bb)*bf	fs =	57344	cf

EAST EMBANKMENT

Existing ground elevation near abutment	E1 =	28.00	
Approximate maximum fill elevation near abutment	E2 =	47.00	
Approximate width of west abutment (2 ft greater than super structure width)	w =	14.00	ft
Horizontal component of slope of fill in front of abutment	xf =	2.00	
Base width of soil wedge = (E2-E1)*xf	bf =	38.00	ft
Fill required in front of abutment = 0.5*b*(E2-E1)*w	ff =	5054	cf
Horizontal component of slope of fill in back of abutment	xb =	12.00	
Base width of soil wedge = (E2-E1)*xb	bb =	228.00	ft
Fill required in front of abutment = 0.5*bb*(E2-E1)*w	fb =	30324	cf
Average height of soil wedges on side of abutment = (E2-E1)/2	hs =	9.50	ft
Fill required on side of abutment = 2*0.5*hs*(bf+bb)*bf	fs =	96026	cf

TOTAL CY OF FILL REQUIRED **7920 CY**

FILL REQUIRED FOR TRUSS CONCEPT 3 AND CABLE STAY CONCEPT 1

WEST EMBANKMENT

Existing ground elevation near abutment	E1 =	28.00	
Approximate maximum fill elevation near abutment	E2 =	36.00	
Approximate width of west abutment (2 ft greater than super structure width)	w =	14.00	ft
Horizontal component of slope of fill in front of abutment	xf =	2.00	
Base width of soil wedge = (E2-E1)*xf	bf =	16.00	ft
Fill required in front of abutment = 0.5*b*(E2-E1)*w	ff =	896	cf
Horizontal component of slope of fill in back of abutment	xb =	12.00	
Base width of soil wedge = (E2-E1)*xb	bb =	96.00	ft
Fill required in front of abutment = 0.5*bb*(E2-E1)*w	fb =	5376	cf
Average height of soil wedges on side of abutment = (E2-E1)/2	hs =	4.00	ft
Fill required on side of abutment = 2*0.5*hs*(bf+bb)*bf	fs =	7168	cf

EAST EMBANKMENT

Existing ground elevation near abutment	E1 =	28.00	
Approximate maximum fill elevation near abutment	E2 =	39.00	
Approximate width of west abutment (2 ft greater than super structure width)	w =	14.00	ft

Horizontal component of slope of fill in front of abutment	xf =	2.00	
Base width of soil wedge = (E2-E1)*xf	bf =	22.00	ft
Fill required in front of abutment = 0.5*b*(E2-E1)*w	ff =	1694	cf
Horizontal component of slope of fill in back of abutment	xb =	12.00	
Base width of soil wedge = (E2-E1)*xb	bb =	132.00	ft
Fill required in front of abutment = 0.5*bb*(E2-E1)*w	fb =	10164	cf
Average height of soil wedges on side of abutment = (E2-E1)/2	hs =	5.50	ft
Fill required on side of abutment = 2*0.5*hs*(bf+bb)*bf	fs =	18634	cf
TOTAL CY OF FILL REQUIRED		**1628**	**CY**

AMMANN & WHITNEY

Project:	**Grays Ferry Ave Ped Bridge**	Index No:	
Subject:	**New Pier & Abutment Construction Cost**	Job No:	**3061**
Designed by:	**NER**	Checked by:	AL
Date:	**May 19, 2010**	Date:	6/30/10

The following calculates the approximate total CY of concrete and LBS of steel for the construction of the new abutments and portions of piers. Assume substructure length perpendicular to C.L. of roadway will be 2'-0" wider than the superstructure width in order to provide sufficient bearing area. Assume required reinforcement is 200 LBS per CY of concrete for piers and 90 LBS per CY of concrete for abutments, which was approximated from sample projects. Assume new concrete portions will be doweled into existing with 18" deep dowels at 12" spacing

EAST & WEST STUB ABUTMENTS (Required for all concepts)

The dimensions calculated below are approximated from PennDOT BC-799M standard for MSE Abutments

Height of abutment (Assume 3' for bearing inspection plus 3' min frost cover)	6.00	ft
Width of abutment	3.50	ft
Length of abutment	14.00	ft
Height of backwall	1.00	ft
Width of backwall	1.167	ft
Length of backwall	14.00	ft
Total CY of Concrete for East & West Abutments	23	CY
Total LBS of Reinforcement for East & West Abutments	2070	LBS

***Assume each stub abutment is supported on 4 - HP12x53 piles (each having a 50 ft length)*

Total LF of HP pile	400	ft

EAST & WEST PIERS, 35 ft HEIGHT (Required for Truss Concept 3 & Cable-Stay Concepts 1 & 3

Height of pier	35.00	ft
Width of pier	3.00	ft
Length of pier	14.00	ft
Total CY of Concrete for 35 ft High East & West Piers	109	CY
Total LBS of Reinforcement for 35 ft High East & West Piers	21800	LBS
Total number of dowels for East and West Piers	66	

EAST & WEST PIERS, 45 ft HEIGHT (Required for Truss Concepts 1 & 2)

Height of pier	45.00	ft
Width of pier	3.00	ft
Length of pier	14.00	ft
Total CY of Concrete for 45 ft High East & West Piers	140	CY
Total LBS of Reinforcement for 45 ft High East & West Piers	28000	LBS
Total number of dowels for East and West Piers	66	

CENTER PIER, 35 ft HEIGHT (Required for Truss Concept 3 & Cable-Stay Concept 1)

Height of pier	35.00	ft
Width of pier	3.00	ft
Length of pier	14.00	ft
Total CY of Concrete for 35 ft High Center Pier	55	CY
Total LBS of Reinforcement for 35 ft High Center Pier	11000	LBS
Total number of dowels for Center Pier	66	

CENTER PIER, 45 ft HEIGHT (Required for Truss Concept 1)

Height of pier	45.00	ft
Width of pier	3.00	ft
Length of pier	14.00	ft
Total CY of Concrete for 45 ft High Center Pier	**70**	**CY**
Total LBS of Reinforcement for 35 ft High Center Pier	**14000**	**LBS**
Total number of dowels for Center Pier	**66**	

ABUTMENT & PIER CAP RECONSTRUCTION

Assume bearing area of the substructure is reconstructed with a 2 ft high cap with the same plan area as the existing abutment and piers. Assume required reinforcment is 90 LBS per CY of concrete for abutment and pier caps.

East Abutment (Required for Cable-Stay Concepts 1 & 2)

Height of cap	2.00	ft
Width of cap	6.00	ft
Length of cap	26.67	ft
Volume of cap	12	CY
Total LBS of Reinforcement for East Abutment	1067	LBS
Total number of dowels for East Abutment	64	

West Abutment (Required for Cable-Stay Concepts 1 & 2)

Height of cap	2.00	ft
Width of cap	6.00	ft
Length of cap	50.00	ft
Volume of cap	22	CY
Total LBS of Reinforcement for West Abutment	2000	LBS
Total number of dowels for West Abutment	110	

East & West Pier (Required for Cable-Stay Concepts 2 & 3)

Height of cap	2.00	ft
Width of center portion of cap	7.67	ft
Length of center portion of cap	25.00	ft
Width of triangular end portion of cap	7.67	ft
Length of triangular end portion of cap	3.83	ft
Volume of East & West Pier cap	31	CY
Total LBS of Reinforcement for East and West Pier cap	2751	LBS
Total number of dowels for East and West Pier	130	

Center Pier (Required for Cable-Stay Concept 2 only)

Height of cap	2.00	ft
Diameter of cap	29.75	ft
Volume of cap	51	CY
Total LBS of Reinforcement for Center Pier cap	4634	LBS
Total number of dowels for Center Pier	94	
Total CY for Abutment Reconstruction for Cable-Stay Concept 1	**35**	**CY**
Total LBS of reinf. for Abutment Recon. For Cable-Stay Concept 1	**3067**	**LBS**
Total 18" Dowel Holes for Abutment Recon. For Cable-Stay Concept 1	**174**	

Total CY for Abutment and Pier Cap Reconstruction for Cable-Stay Concept 2	117	CY
Total LBS of reinf. for Abutment and Pier Cap Recon. For Cable-Stay Concept 2	10452	LBS
Total 18" Dowel Holes for Abutment and Pier Cap recon. For Cable-Stay Concept 2	398	
Total CY for Abutment and Pier Cap Reconstruction for Cable-Stay Concept 3	31	CY
Total LBS of reinf. for Abutment and Pier Cap Recon. For Cable-Stay Concept 3	2751	LBS
Total 18" Dowel Holes for Abutment and Pier Cap recon. For Cable-Stay Concept 3	130	

TRUSS CONCEPT 1

Total CY of Concrete	233	CY
Total LBS of Reinforcement	44070	LBS
Total number of 18" Dowel Holes	132	

TRUSS CONCEPT 2

Total CY of Concrete	163	CY
Total LBS of Reinforcement	30070	LBS
Total number of 18" Dowel Holes	66	

TRUSS CONCEPT 3

Total CY of Concrete	187	CY
Total LBS of Reinforcement	34870	LBS
Total number of 18" Dowel Holes	132	

CABLE-STAY CONCEPT 1

Total CY of Concrete	222	CY
Total LBS of Reinforcement	37937	LBS
Total number of 18" Dowel Holes	306	

CABLE-STAY CONCEPT 2

Total CY of Concrete	140	CY
Total LBS of Reinforcement	12522	LBS
Total number of 18" Dowel Holes	398	

CABLE-STAY CONCEPT 3

Total CY of Concrete	163	CY
Total LBS of Reinforcement	26621	LBS
Total number of 18" Dowel Holes	196	

AMMANN & WHITNEY

Project: **Grays Ferry Avenue Pedestrian Bridge** | Index No:
Subject: **Cable Concept 1 Preliminary Design** | Job No: **3061**
Designed by: **AL** | Checked by: NER
Date: **June 4, 2010** | Date: 6/29/10

References

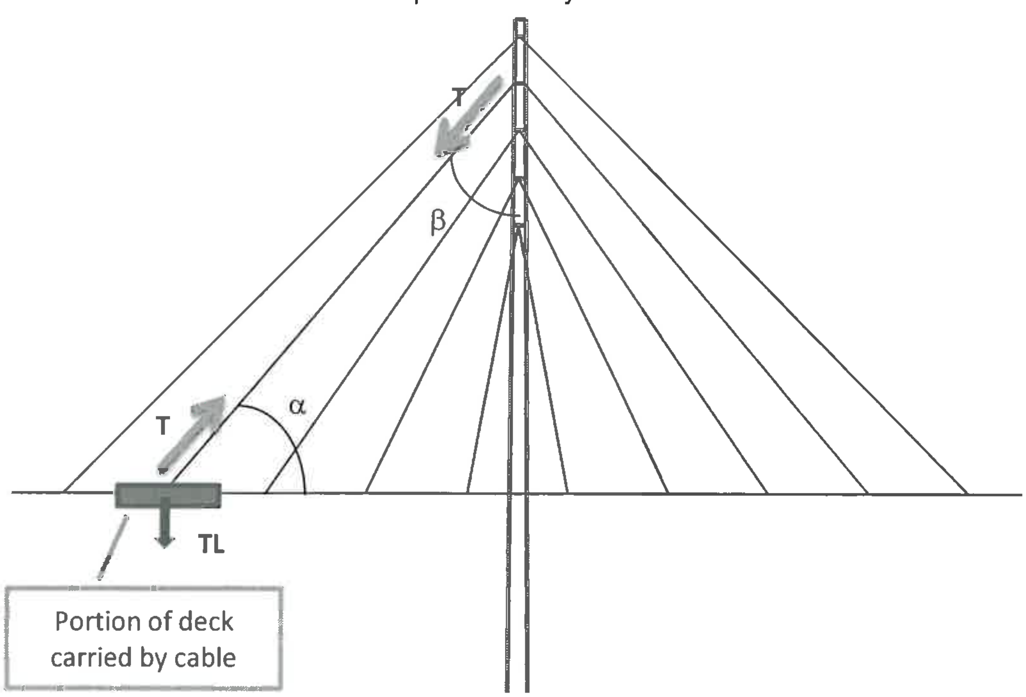
- AASHTO Standard Specifications, 15th Edition, 1992.

Description	Symb	Value	Unit	Reference
Deck Section Length	S	28.00	FT	
Bridge DL /ft	w	1.37	KLF	See deck calculation spreadsheet
Bridge LL /ft	p	0.85	KLF	
Nbr of Cables / Section	n	2.00		Two planes of cables
Service dead load / Cable	TLdl	19.18		
Service live load / Cable	TLll	11.90	K	= (w + p) * S / n

	α	β	Tdl=TLdl / sin(α)	Tll=TLll / sin(α)	Total Cable Tension	2*(1.3*Tdl+ 2.17*Tll) * cos(β)
Cable 1	38.32	51.67	30.93	19.19	50.12	101.54
Cable 2	44.78	45.20	27.23	16.89	44.12	101.55
Cable 3	55.65	34.33	23.23	14.41	37.65	101.54
Cable 4	75.32	14.68	19.83	12.30	32.13	101.51

Factored mast force = Σ 2 Ti cos(βi) = **406.14** KIPS

Cable Design Force, assuming FS=2.2 (or 0.45 * GUTS)
= Tmax * 2.2 = 110.27 Kips Say **110** **KIPS**



Project:	**Grays Ferry Avenue Pedestrian Bridge**	Index No:	
Subject:	**Cable Concept 1 Preliminary Design**	Job No:	**3061**
Designed by:	**AL**	Checked by:	NER
Date:	**June 4, 2010**	Date:	6/29/10

Cable Design

Description	Symb	Value	Unit	Reference
Working load per	Fkn	125.58	KN	1507 KN / 12 strands (SYWIDAG Systems Brochure)
strand:	Fk	28.23	KIPS	
Nbr of strands required	Ns	3.90		
mber of cables required / mast	Nc	16		
Cable 1 Length		249.86	FT	
Cable 2 Length		197.26	FT	
Cable 3 Length		148.92	FT	
Cable 4 Length		110.58	FT	
Total length per span		1413.24	FT	
Total length for bridge		2826.48	FT	

Mast Design

Description	Symb	Value	Unit	Reference
Yield strength	Fy	50.00	KSI	
Modulus of Elasticity	E	29000.00	KSI	
Height of Mast	H	77.50	FT	Masts are assumed to be braced at deck level
Section Dimension	a	33.50	IN	
Wall thickness	t	0.75	IN	
X-Sectional area	Am	98.25	IN^2	
Inertia	Im	17572.42	IN^4	= (a^4 - (a - t) ^4 / 12
Sectional Modulus	Sm	1049.10	IN^3	= Im / (a/2)
Radius of Gyration	r	13.37	IN	= (Im / Am) ^ 1/2
Slenderness Coefficient	K	2.00		
Slenderness ratio		139.08		= K * H / r^2
	Cc	107.00		= (2 * pi^2 * E / Fy) ^1/2
Buckling stress	Fcr	14.80	KSI	Eqns 10-151 & 10-153 AASHTO
Capacity of Mast	Pcr	421.34	KIPS	= 0.85 * Am * Fcr
Check adequacy		**ADEQUATE**		

Project: **Grays Ferry Avenue Pedestrian Bridge**
Subject: **Cable Concept 1 Preliminary Cost Estimate** **3061**
Designed by: **AL**
Date: **June 4, 2010**

NER
6/29/10

CABLE INCLUDING PROTECTION

Description	Value	Unit	Reference
Cable 1 Length	249.86	FT	
Cable 2 Length	197.26	FT	
Cable 3 Length	148.92	FT	
Cable 4 Length	110.58	FT	

There are 4 cables for each of the lengths presented above

MASTS

Height	Htot	113.75	FT	
X-sectional area at base	Am	98.25	IN^2	
X-Sectional area at top	Am2	58.95	IN^2	Assumed 60% of base
Number of masts	Nm	4.00		
Weight of masts	Wm	121693.54	LBS	
Weight of deck brace		6686.46	LBS	Assumed same section as mast
Total Fab Struct Steel		**128380.00**	LBS	and 10 ft length

AMMANN & WHITNEY

Project:	**Grays Ferry Avenue Pedestrian Bridge**	Index No:	
Subject:	**Cable Concept 2 Preliminary Design**	Job No:	**3061**
Designed by:	**AL**	Checked by:	NER
Date:	**June 4, 2010**	Date:	6/29/10

References

- AASHTO Standard Specifications, 15th Edition, 1992.

Description	Symb	Value	Unit	Reference
Deck Section Length	S	20.00	FT	
Bridge DL /ft	w	1.37	KLF	See deck calculation Mathcadsheet
Bridge LL /ft	p	0.85	KLF	
Nbr of Cables / Section	n	2.00		Two planes of cables
Service dead load / Cable	TLdl	13.70		
Service live load / Cable	TLll	8.50	K	= (w + p) * S / n

	α	β	Tdl=TLdl/sin(α)	Tll=TLll/sin(α)	Total Cable Tension
Cable 1	42.50	72.97	20.28	12.58	32.86
Cable 2	52.52	62.93	17.26	10.71	27.97
Cable 3	69.37	46.10	14.64	9.08	23.72

Cable Design Force, assuming FS=2.2

= Tmax * 2.2 = 72.29 Kips Say **75** **KIPS**

Cable Design

Description	Symb	Value	Unit	Reference
Working load per	Fkn	125.58	KN	1507 KN / 12 strands (SYWIDAG Systems Brochure)
strand:	Fk	28.23	KIPS	
Nbr of strands required	Ns	2.66		
Number of cables required	Nc	12.00		
Cable 1 Length		136.00	FT	
Cable 2 Length		106.00	FT	
Cable 3 Length		80.00	FT	
Total length per span		644	FT	
Total length for bridge		2576	FT	

Mast Design

Description	Symb	Value	Unit	Reference
Deck Length	L	120.00	FT	
Total Deck Dead Load	DL	164.4	KIPS	= L * w
Total Deck Live Load	LL	102	KIPS	= L * p
Moment due to 1 KIP	My+	0.00	K-FT	Larsa analysis
Moment due to 1 KIP	My-	0.01	K-FT	Larsa analysis
Axial Force du to 1 KIP	FX	0.58	KIPS	Larsa analysis

Factored Axial Force in Leg	251.03	KIPS
Factored +Moment in Leg	0.00	K-FT
Factored -Moment in Leg	3.48	K-FT

Since the moments are so small, design for axial force only.

Yield strength	Fy	50.00	KSI	
Modulus of Elasticity	E	29000.00	KSI	
Length of Leg	H	102.00	FT	
Section Dimension	a	28.50	IN	
Wall thickness	t	0.75	IN	
X-Sectional area	Am	83.25	IN^2	
Inertia	Im	10692.42	IN^4	= (a^4 - (a - t)^4 / 12
Sectional Modulus	Sm	750.35	IN^3	= Im / (a/2)
Radius of Gyration	r	11.33	IN	= (Im / Am) ^ 1/2
Slenderness Coefficient	K	1.50		Buckling factor is reduced from 2.0 to account for mutual bracing between legs.
Slenderness ration		162.00		= K * H / r
	Cc	107.00		= (2 * pi^2 * E / Fy) ^ 1/2
Buckling stress	Fcr	10.91	KSI	Eqns 10-151 & 10-153 AASHTO
Capacity of Mast	Pcr	264.18	KIPS	= 0.85 * Am * Fcr
Check adequacy		**ADEQUATE**		

AMMANN & WHITNEY

Project:	**Grays Ferry Avenue Pedestrian Bridge**		
Subject:	**Cable Concept 2 Preliminary Cost Estimate**	Job No:	**3061**
Designed by:	**AL**	Checked by:	
Date:	**June 4, 2010**	Date:	

CABLE INCLUDING PROTECTION

Description	Value	Unit	Reference
Cable 1 Length	136.00	FT	
Cable 2 Length	106.00	FT	
Cable 3 Length	80.00	FT	

There are 8 cables for each of the lengths presented above

MASTS

Height	Htot	102.00	FT	
X-sectional area at base	Am	83.25	IN^2	
X-Sectional area at top	Am2	49.95	IN^2	Assumed 60% of base
Number of masts	Nm	8.00		
Weight of masts	Wm	184926.00	LBS	
Weight of deck brace		46741.41	LBS	Assumed same section as mast
Total Fab Struct Steel		**231667.41**	LBS	and 33 ft length

References

AASHTO Standard Specifications, 15th Edition, 1992.

Geometry and Preliminary Loads

Description	Symb	Value	Unit	Reference
Deck Section Length	S	22.63	FT	Measured from CADD
Bridge DL / ft	w	1.37	KLF	See deck calculation Mathcad sheet
Bridge LL / ft	p	0.85	KLF	See deck calculation Mathcad sheet
Nbr of Cables / Section	n	2		Two planes of cables
Service dead load / Cable	TLdl	15.50	KIPS	= w*S / n
Service live load / Cable	TLll	9.62	KIPS	= p*S / n

	α	β = 90-α	Tdl = TLdl/sin(α)	Tll = TLll/sin(α)	Total Cable Tension	2 * (1.3*Tdl + 2.17*Tll) * cos(β)
Cable 1	34.18	55.82	27.59	17.12	44.71	82.05
Cable 2	36.06	53.94	26.33	16.34	42.67	82.05
Cable 3	39.15	50.85	24.55	15.23	39.79	82.05
Cable 4	45.05	44.95	21.90	13.59	35.49	82.05
Cable 5	58.53	31.47	18.17	11.28	29.45	82.05

Factored mast force = **410.23** KIPS

Description	Symb	Value	Unit	Reference	
Max cable tension	Tmax	44.71	KIPS	Max from above table	
Factor of safety	FS	2.20		Assumed	
Cable design force	Fcable	99	KIPS	= Tmax * FS	(Roundup)

Cable Design

Description	Symb	Value	Unit	Reference
Working load per strand	Fstrand	28.23	KIPS	DYWIDAG brochure (1507-KN per 12-strands)
Nbr of strands required	Ns	3.51		= Fcable / Fstrand
Number of cables required	Nc	20.00		See drawings
Cable 1 Length	L1	124.00	FT	Measured from CADD
Cable 2 Length	L2	100.00	FT	Measured from CADD
Cable 3 Length	L3	74.00	FT	Measured from CADD
Cable 4 Length	L4	48.00	FT	Measured from CADD
Cable 5 Length	L5	20.00	FT	Measured from CADD
Total length per span	Lspan	732	FT	= 2 * (ΣLi)
Total length for bridge	Lbridge	2928	FT	= Lspan *4

AMMANN & WHITNEY

Project:	**Grays Ferry Avenue Pedestrian Bridge**	Index No:	
Subject:	**Cable-Stay Concept 3 Preliminary Design**	Job No:	**3061**
Designed by:	**AIS**	Checked by:	NER
Date:	**June 24, 2010**	Date:	6/29/10

Mast Design

Yield strength	Fy	50.00	KSI	Material property
Modulus of Elasticity	E	29,000	KSI	Material property
Length of Leg	H	75.00	FT	Masts assumed to be braced at deck level
Section Dimension	a	33.00	IN	Assumed
Wall thickness	t	0.75	IN	Assumed
X-Sectional area	Am	96.75	IN^2	= a^2 - (a-2t)^2
Inertia	Im	16780.08	IN^4	= (a^4 - (a - t)^4 / 12
Sectional Modulus	Sm	1016.97	IN^3	= Im / (a/2)
Radius of Gyration	r	13.17	IN	= (Im / Am) ^ 1/2
Slenderness Coefficient	K	2.00		Assumed
Slenderness ratio		136.68		= K * H / r^2
	Cc	107.00		= (2 * pi^2 * E / Fy) ^ 1/2
Buckling stress	Fcr	15.32	KSI	Eqns 10-151 & 10-153 AASHTO
Capacity of Mast	Pcr	429.76	KIPS	= 0.85 * Am * Fcr

Check adequacy: **ADEQUATE**

AMMANN & WHITNEY

Project:	**Grays Ferry Avenue Pedestrian Bridge**	Index No:	
Subject:	**Cable-Stay Concept 3 Quantities**	Job No:	**3061**
Designed by:	**AIS**	Checked by:	NER
Date:	**June 25, 2010**	Date:	6/30/10

Cables

NOTE: Installation and anchorages and protection is included and will be taken as a lump sum item

Description	**Symb**	**Value**	**Unit**	**Reference**
Total length of cables	Lcab	2928.00	FT	From design worksheet

Masts

Description	**Symb**	**Value**	**Unit**	**Reference**
Total height	Htot	115.00	FT	Measured from CADD
X-sectional area at bottom	Atop	96.75	IN^2	From design worksheet
X-Sectional area at top	Abot	58.05	IN^2	Assume 60% of bottom dimension
Number of masts	Nm	4.00		From drawings
Weight of masts	Wm	121,152.50	LBS	=Nm*Htot(Atop+Abot)/2/144 * 490-pcf
Weight of deck brace	Wb	32,592.66	LBS	Assume 33-ft length and same section as mast (x2 braces)
Total Fab Struct Steel		153,745.16	LBS	=Wb+Wm

The following is a rough design for the stringer design of a pedestrian cable stay bridge. The purposed of the design at this point is to get numbers for estimating cost of the superstructure and cables.

Stringer Design

Dead Load

Deck

$\boxed{t_d := 5.5in}$ — Thickness of deck

$\gamma_c := 0.15\left(\frac{kip}{ft^3}\right)$ — Unit weight of concrete

$SIP := 0.015\frac{kip}{ft^2}$ — Weight of stay-in-place forms

$D_{DL} := t_d \cdot \gamma_c + SIP = 0.08 \cdot ksf$ — Square foot weight of deck

Curb

$t_c := 4in$ — Approximate thickness of curb

$w_c := 12in$ — Approximate width of curb

$C_{DL} := \gamma_c \cdot t_c \cdot w_c = 0.05 \cdot \frac{kip}{ft}$ — Linear weight of one curb

Railing

$R_{DL} := 0.05\frac{kip}{ft}$ — Linear weight of one railing

Beam Weight

$S_{DL} := 0.1\frac{kip}{ft}$ — Approximate self weight of stringer

$B_{DL} := 0.25 \cdot S_{DL} = 0.03 \cdot klf$ — Approximate linear weight of bracing

$\boxed{s := 11ft}$ — Approximate stringer spacing

Total Dead Load and Dead Load Moments on Stringer

$DL := D_{DL} \cdot \frac{s}{2} + S_{DL} + B_{DL} = 0.59 \cdot klf$ — Total DL on stringer

$SDL := C_{DL} + R_{DL} = 0.10 \cdot klf$ — Total superimposed DL on stringer

$\boxed{cs := 28ft}$ — Distance between cable stays (stringer supports)

$M_{DL} := 0.16 \cdot DL \cdot cs^2 = 73.46 \cdot ft \cdot kip$ — Dead Load moment (AISC Manual 2nd Edition - Beam Diagrams and Formulas Continuous Beams)

$M_{SDL} := 0.16 \cdot SDL \cdot cs^2 = 12.54 \cdot ft \cdot kip$ — Superimposed Dead Load moment (AISC Manual 2nd Edition - Beams Diagrams and Formulas Continuous Beams)

Live Load

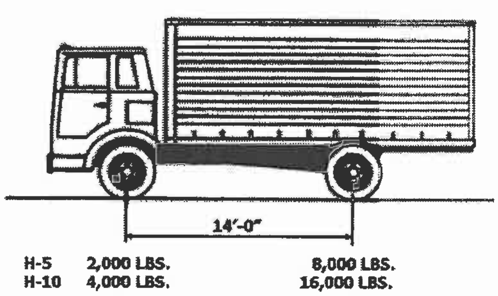
Pedestrian Live Load

$LL_{ped} := .085 \frac{kip}{ft^2}$ — Pedestrian Live Load

$\boxed{Rw := 10ft}$ — Roadway width

$M_{LLped} := 0.16 \cdot \left(LL_{ped} \cdot \frac{Rw}{2} \right) \cdot cs^2 = 53.31 \cdot ft \cdot kip$ — Pedestrian Live Load moment

H5 Vehicular Live Load



Axle Loads

Based on engineering judgement, the pedestrian live load will govern the stringer design, therefore vehicular live load moment was not calculated.

ASD Check

*Assume non-composite section

$M_{max} := M_{DL} + M_{SDL} + M_{LLped} = 139.32 \cdot ft \cdot kip$ Total maximum moment

$f_y := 50 \dfrac{kip}{in^2}$ Yield strength of steel

$S_{reqd} := \dfrac{M_{max}}{(0.55 \cdot f_y)} = 60.79 \cdot in^3$ Minimum required section modulus

$\boxed{\text{Try W12x50}}$

$\boxed{S_o := 64.2in^3}$

$\boxed{S_n := 105.8in^3}$ See attached Girder Section Properties calc sheet

$\boxed{S_{3n} := 94.2in^3}$ See attached Girder Section Properties calc sheet

LFD Check

$$\sigma_b := \left(1.3 \cdot \frac{M_{DL}}{S_o}\right) + \left(1.3 \cdot \frac{M_{SDL}}{S_{3n}}\right) + \left(2.17 \cdot \frac{M_{LLped}}{S_n}\right) = 33.05 \cdot ksi$$

$\boxed{Check_{LFD} := if(\sigma_b \le f_y, \text{"FLEXURE OK"}, \text{"FLEXURE NG"}) = \text{"FLEXURE OK"}}$

Total Bridge Loads for Cable Stay Design

$w_{DL} := 2 \cdot (DL + SDL) = 1.37 \cdot klf$ Total Bridge Dead Load/ft

$w_{LL} := LL_{ped} \cdot Rw = 0.85 \cdot klf$ Total Bridge Live Load/ft

AMMANN & WHITNEY

COMP BY	NER	DATE	6/9/10	PROJECT	Grays Ferry Ave Pedestrian Bridge
CHK'D BY	AL	DATE	6/9/10	SUBJECT	Stringer Gross Section Properties

SHT NO
JOB NO 3061

STEEL GIRDER SECTION PROPERTIES CALCULATION

	Eff Flange Width Calc				
	Top Pl Eff	Top Flg Eff	Bot Flg Eff	Bot Pl Eff	
Comp or Ten	C	C	T	T	
Flg W	0.000	8.080	8.080	0.000	in
Flg T	0.000	0.640	0.640	0.000	in
Bolt Dia	0.000	0.000	0.000	0.000	in
# of Bolts	0	0	0	0	
Hole Dia	0.000	0.000	0.000	0.000	in
EFF Width	0.00	8.08	8.08	0.00	in

NOTES: A10.16.14.6 Use hole dia as 1/8" greater than bolt dia.
A10.18.1.1 Compression member use Ag
A10.18.1.1 Ae is amount above 15% removed from Ag

	Slab Eff Width Calc	
Span Length	28.00 ft	
Beam Spa	11.00 ft	AASHTO
OverHang W	0.00 ft	10.38.1
1/4 SL	84.00 in	
Bm Span	132.00 in	
12*ts	66.00 in	= beff

SECTION DIMENSIONS

	Width (in)	Height (in)*
Deck	66.00	5.5
Haunch	-	0
Top Plate	0.000	0.000
Top Flange	8.080	0.640
Web	0.370	10.920
Bot Flange	8.080	0.640
Bot Plate	0.000	0.000
n	8.000	

* - from top of deck to to top of beam

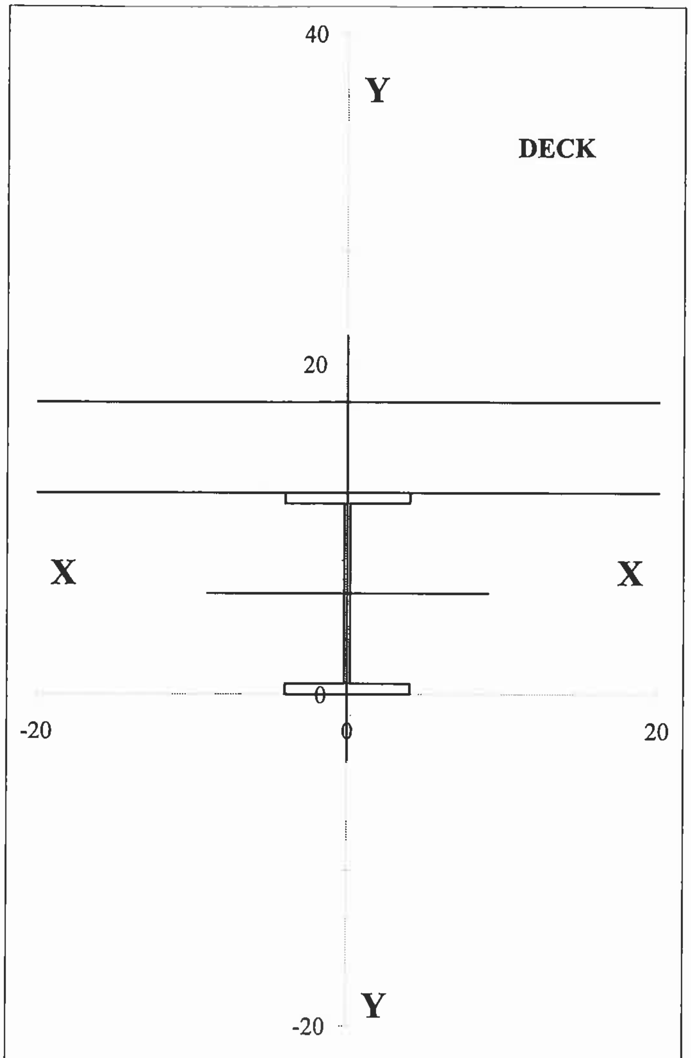
COMPONENT SECTION PROPERTIES - NONCOMPOSITE

AXIS X-X	Area (in^2)	Yx (in)	Ix (in^4)
Top Plate	0.000	6.100	0.00
Top Flange	5.171	5.780	172.94
Web	4.040	0.000	40.15
Bot Flange	5.171	5.780	172.94
Bot Plate	0.000	6.100	0.00

AXIS Y-Y	Area (in^2)	Yy (in)	Iy (in^4)
Top Plate	0.000	0.000	0.00
Top Flange	5.171	0.000	28.13
Web	4.040	0.000	0.05
Bot Flange	5.171	0.000	28.13
Bot Plate	0.000	0.000	0.00

COMPONENT SECTION PROPERTIES - COMPOSITE

AXIS X-X	Area (in^2)	Yx (in)	Ix (in^4)
Deck (3n)	15.125	14.950	38.13
Deck (n)	45.375	14.950	114.38
Top Plate	0.000	12.200	0.00
Top Flange	5.171	11.880	0.18
Web	4.040	6.100	40.15
Bot Flange	5.171	0.320	0.18
Bot Plate	0.000	0.000	0.00



Cross Section of Beam w/ NA Located

GIRDER SECTION PROPERTIES

Non-Composite Axis X-X	
Ag	14.38 in^2
Ix	386 in^4
Stx	63.3 in^3
Sbx	63.3 in^3
ytx	6.10 in
ybx	6.10 in
rx	5.18 in
Zx	70.81 in^3

Composite 3n Axis X-X	
Ag	29.51 in^2
Ix	1002 in^4
Sty	640.5 in^3
Sby	94.2 in^3
ytx	1.56 in
ybx	10.64 in

Non-Composite Axis Y-Y	
Ag	14.38 in^2
Iy	56 in^4
Sty	9.2 in^3
Sby	9.2 in^3
yty	0.00 in
yby	0.00 in
ry	1.98 in

Composite n Axis X-X	
Ag	59.76 in^2
Ix	1356 in^4
Sty	-2187.0 in^3
Sby	105.8 in^3
ytx	-0.62 in
ybx	12.82 in

The following calculates the approximate weight of steel, volume of concrete and weight of reinforcement required for the proposed Cable-Stay Concept's 1 & 2 superstructures.

CABLE-STAY CONCEPT - 1

STEEL (Stringers, Floorbeams & Bracing)

Linear weight of stringer (W12x50) (See stringer design)	ws =	50.0	plf
Total length of stringer	Ls =	654.0	ft
Total weight of stringer	SW =	32700	lbs
Total weight of bracing (Assume 20% of stringer weight)	BW =	6540	lbs
Linear weight of floorbeam (Conservatively assume same as stringer)	wf =	50.0	plf
Total length of floorbeam (One at each stay) (16 stays x 13')	Lf =	208.0	ft
Total weight of floorbeam	FW =	10400	lbs
Total LBS of steel for Cable-Stay Concept - 1 Superstructure		**49640**	**LBS**

CONCRETE (Deck & Curb)

Width of Deck	wd =	12.0	ft
Thickness of Deck	td =	0.46	ft
Length of Deck	Ld =	554.0	ft
Width of Curb	wc =	1.0	ft
Height of Curb	hc =	0.33	ft
Total cubic feet of concrete	vc =	3416	cf
Total CY of concrete for Cable-Stay Concept - 1 Superstructure		**127**	**CY**

REINFORCEMENT (Deck & Curb)

**Assume required deck reinforcement is 200 lbs per CY of concrete*

Total LBS of reinforcement for Cable-Stay Concept - 1 Superstructure		**25400**	**LBS**

CABLE-STAY CONCEPT - 2

STEEL (Stringers, Floorbeams & Bracing)

Linear weight of stringer (W12x50) (See stringer design)	ws =	50.0	plf
Total length of stringer	Ls =	1108.5	ft
Total weight of stringer	SW =	55425	lbs
Total weight of bracing (Assume 20% of stringer weight)	BW =	11085	lbs
Linear weight of floorbeam (Conservatively assume same as stringer)	wf =	50.0	plf
Total length of floorbeam (Assume 8 stays for main span) (24 stays x 13')	Lf =	312.0	ft
Total weight of floorbeam	FW =	15600	lbs
Total LBS of steel for Cable-Stay Concept - 2 Superstructure		**82110**	**LBS**

CONCRETE (Deck & Curb)

Width of Deck	wd =	12.0	ft
Thickness of Deck	td =	0.46	ft
Length of Deck	Ld =	554.3	ft
Width of Curb	wc =	1.0	ft
Height of Curb	hc =	0.33	ft
Total cubic feet of concrete	vc =	3418	cf
Total CY of concrete for Cable-Stay Concept - 2 Superstructure		**127**	**CY**

REINFORCEMENT (Deck & Curb)

**Assume required deck reinforcement is 200 lbs per CY of concrete*

Total LBS of reinforcement for Cable-Stay Concept - 2 Superstructure		**25400**	**LBS**

AMMANN & WHITNEY

Project:	Grays Ferry Ave Ped Bridge	Index No:	
Subject:	Steel and Concrete for Cable-Stay Superstructures	Job No:	3061
Designed by:	NER	Checked by:	AL
Date:	June 10, 2010	Date:	07/06/10

CABLE-STAY CONCEPT - 3

**This concept is esentially the same as concept-1 with the emilination of reusing the existing truss*

STEEL (Stringers, Floorbeams & Bracing)

Linear weight of stringer (W12x50) (See stringer design)	ws =	50.0	plf
Total length of stringer	Ls =	843.6	ft
Total weight of stringer	SW =	42181	lbs
Total weight of bracing (Assume 20% of stringer weight)	BW =	8436	lbs
Linear weight of floorbeam (Conservatively assume same as stringer)	wf =	50.0	plf
Total length of floorbeam (Assume 8 stays for main span) (20 stays x 13')	Lf =	260.0	ft
Total weight of floorbeam	FW =	13000	lbs

Total LBS of steel for Cable-Stay Concept - 2 Superstructure **63618 LBS**

CONCRETE (Deck & Curb)

Width of Deck	wd =	12.0	ft
Thickness of Deck	td =	0.46	ft
Length of Deck	Ld =	421.8	ft
Width of Curb	wc =	1.0	ft
Height of Curb	hc =	0.33	ft
Total cubic feet of concrete	vc =	2601	cf

Total CY of concrete for Cable-Stay Concept - 2 Superstructure **97 CY**

REINFORCEMENT (Deck & Curb)

**Assume required deck reinforcement is 200 lbs per CY of concrete*

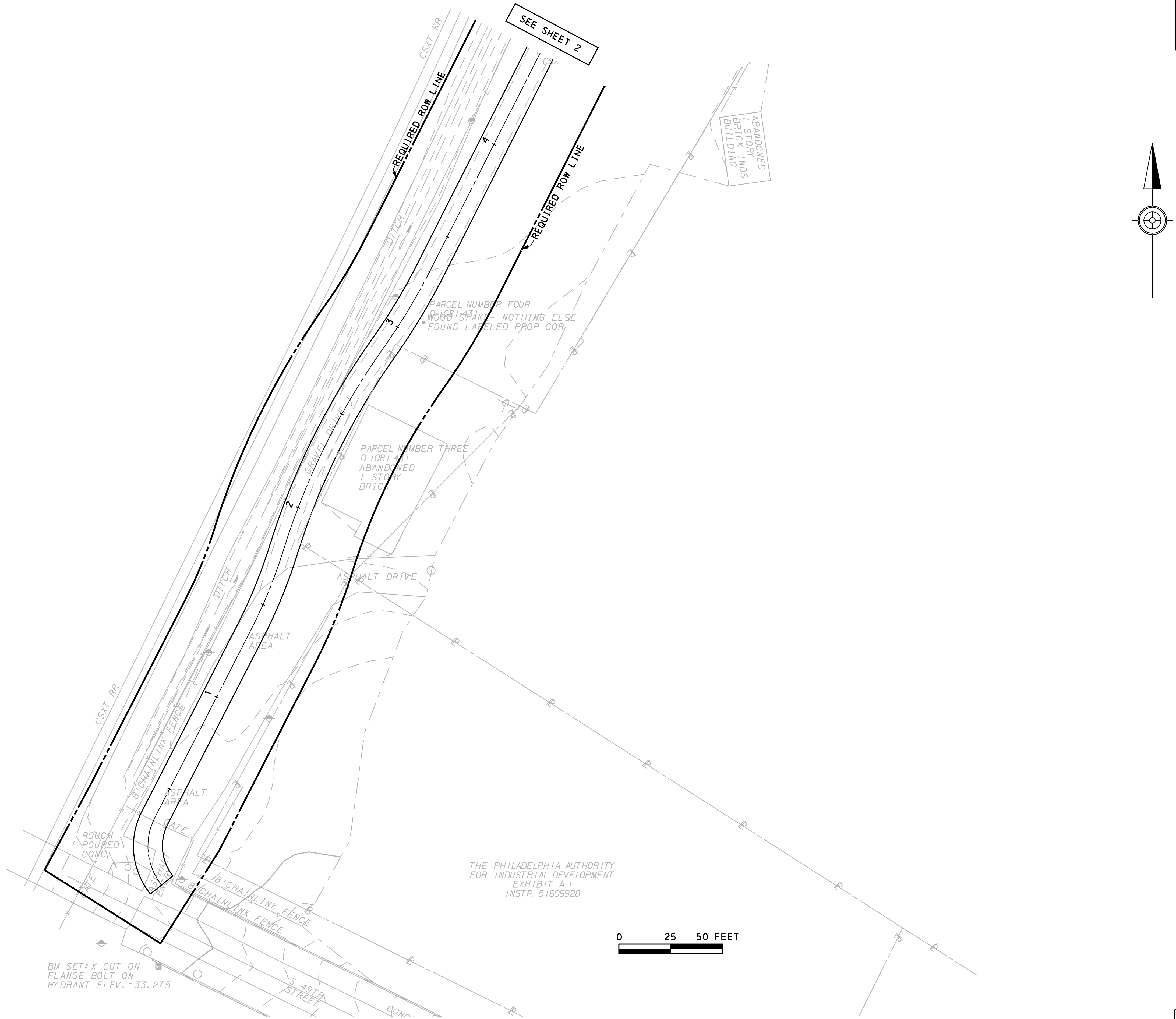
Total LBS of reinforcement for Cable-Stay Concept - 2 Superstructure **19400 LBS**

APPENDIX D

(Roadway Plans)

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-0	PHILADELPHIA			1 OF 7
CITY OF PHILADELPHIA				

REVISION NUMBER	REVISIONS	DATE	BY



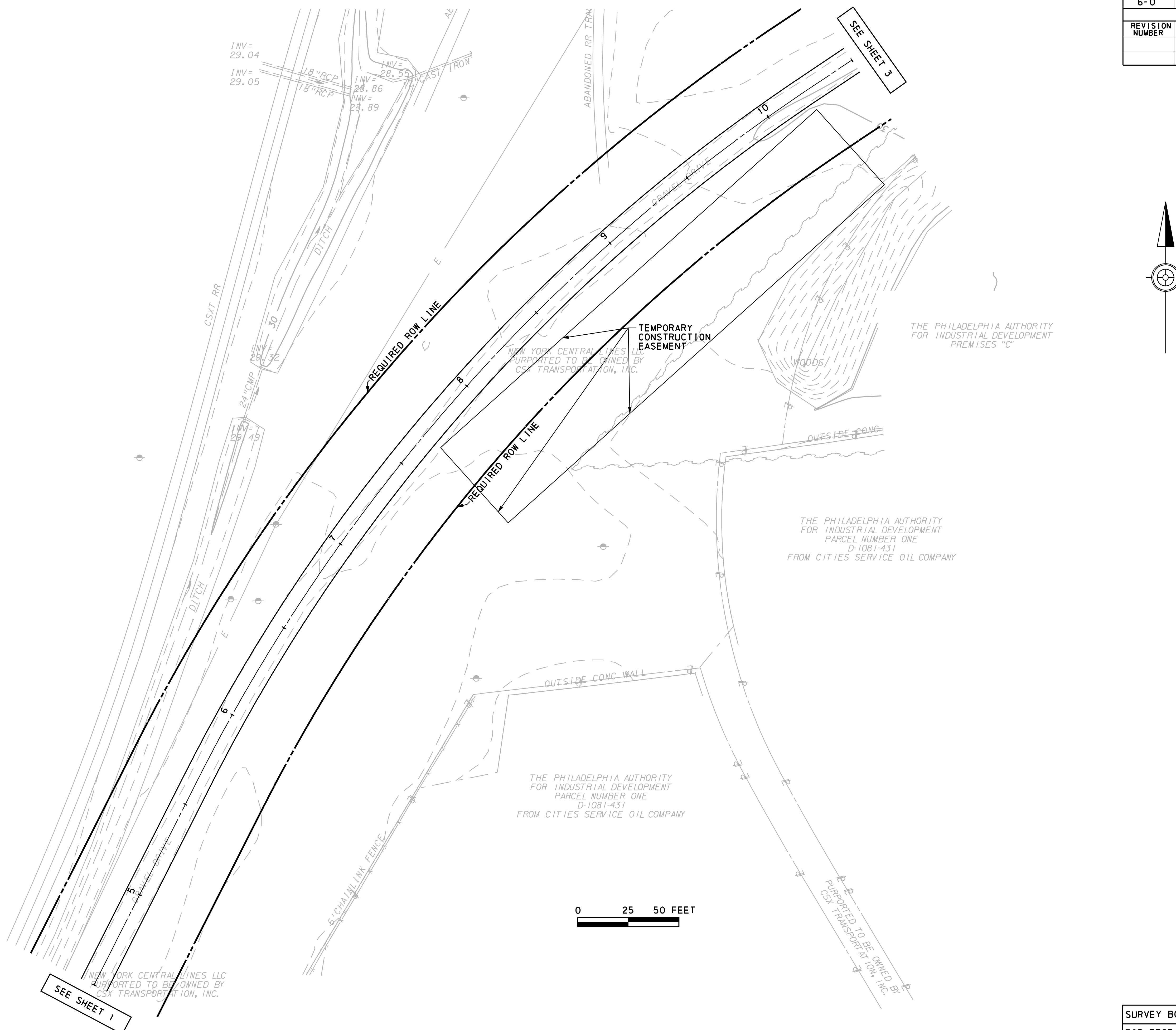
SURVEY BOOK NO:

FOR PROFILE , SEE SHEET

H:\PA-CLIENTS\3061\3061-CADD\3061-C\3061cpln1.dgn DATE: 12/23/2010 TIME: 10:58:03 AM

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-0	PHILADELPHIA			2 OF 7
CITY OF PHILADELPHIA				

REVISION NUMBER	REVISIONS	DATE	BY



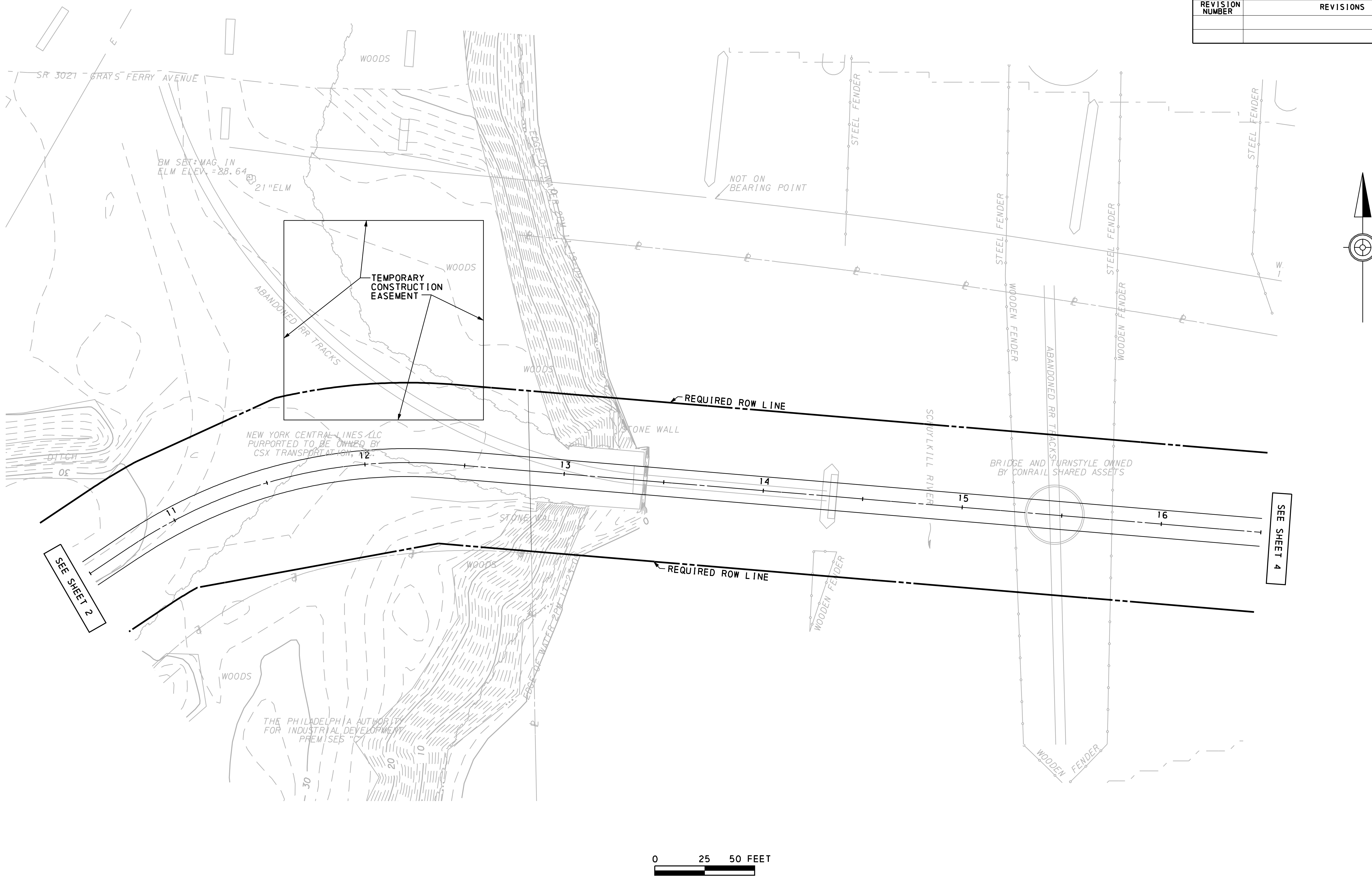
SURVEY BOOK NO:

FOR PROFILE , SEE SHEET

m:\po-clients\3061\3061-cadd\3061-c\3061cpin2.dgn DATE: 12/23/2010 TIME: 10:58:11 AM

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-0	PHILADELPHIA			3 OF 7
CITY OF PHILADELPHIA				

REVISION NUMBER	REVISIONS	DATE	BY



SURVEY BOOK NO:

FOR PROFILE , SEE SHEET

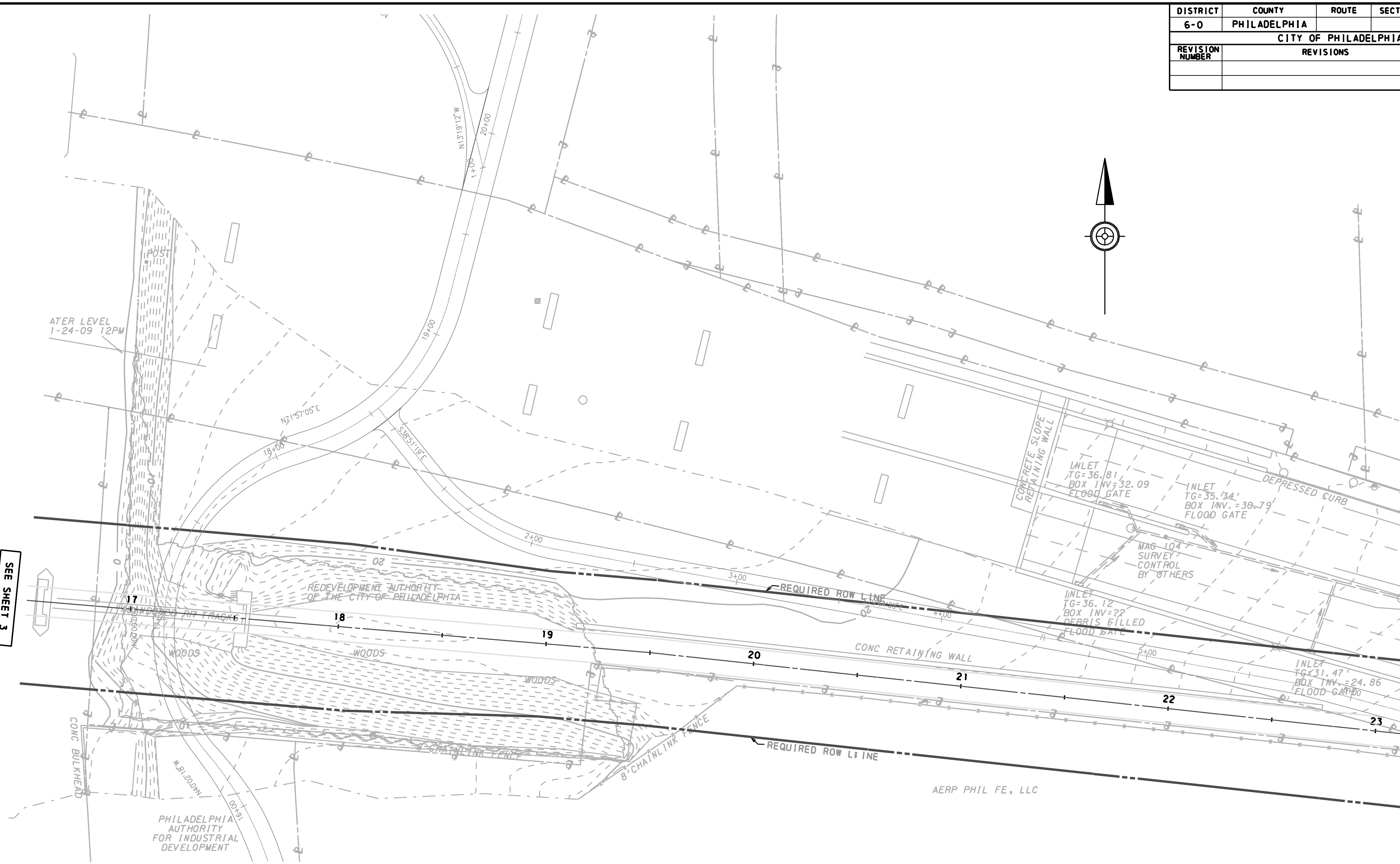
DATE: 12/23/2010 TIME: 10:58:15 AM

m:\po-clients\3061\3061-cadd\3061-c\3061cpln3.dgn

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
6-0	PHILADELPHIA			4 OF 7

CITY OF PHILADELPHIA

REVISION NUMBER	REVISIONS	DATE	BY



SEE SHEET 3

0 25 50 FEET

TIME: $TIME$

DATE: $DATE$

$FILE$

SURVEY BOOK NO:

FOR PROFILE , SEE SHEET

APPENDIX E

(Project Site Photographs)

Figure 1: Looking East at Existing Swing Truss Bridge

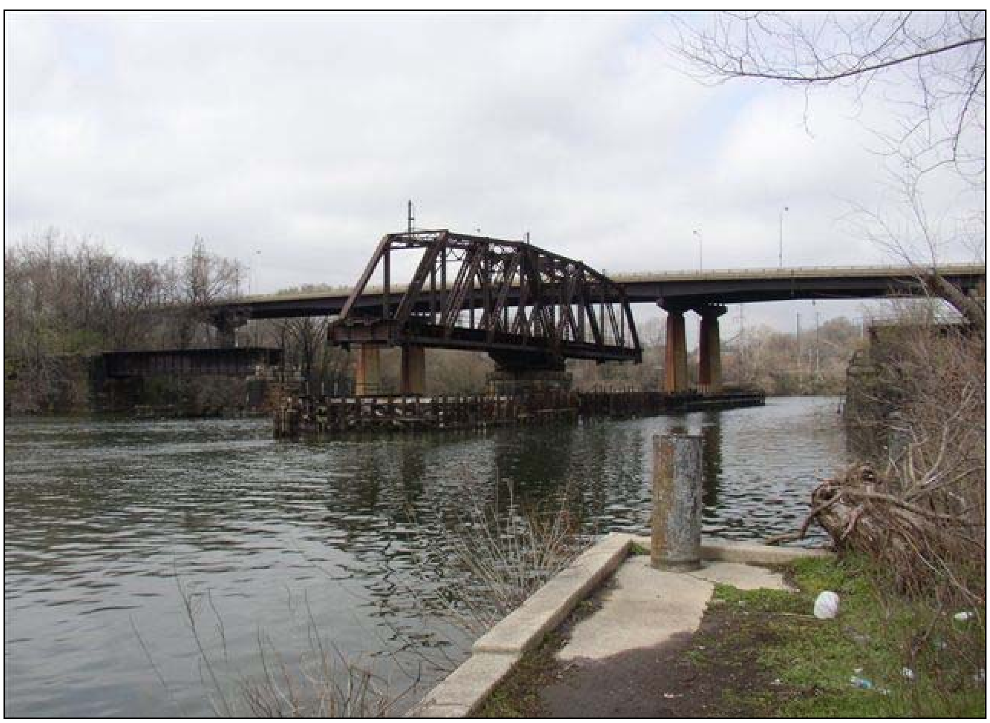


Figure 2: Looking North at Existing Swing Truss Bridge and Grays Ferry Avenue Highway Bridge

Figure 3: Looking at East Bank from Grays Ferry Avenue Highway Bridge

Figure 4: Looking at West Bank from Grays Ferry Avenue Highway Bridge

Figure 5: Looking West at Existing Swing Truss Bridge

Figure 6: Looking West at South End of Open Truss (Deteriorated Fender System)

APPENDIX F

(Public Involvement)

memo

schuylkill river development corporation

November 16, 2009

to: Invitees, File
from: Lane Fike, P.E.
re: Grays Ferry Pedestrian Bridge – Feasibility Study
Stakeholder Committee Meeting – Nov. 12, 2009– 1:30 to 3:00
Philadelphia Trolley Works - Conference Room

Invitees:

- Louise Turan, Bartrams Garden
- Michael Kates, Philadelphia Trolley Works (PTW)
- Sarah Clark Stuart, SRPA & Bicycle Coalition
- Karen Cilurso, DVRPC
- Deborah Schaaf, PCPC
- Jon Edelstein, City Commerce Dept. - unavailable
- Donna Henry, SWCDC - unavailable
- Lane Fike, SRDC

o Joseph Syrnick, SRDC
o Joe Sullivan, Ammann & Whitney

- Stakeholder Committee Member

After introductions of all attendees, Joe Syrnick summarized the goals of SRDC and the projects currently underway. The major goal is to revitalize the Tidal or Lower Schuylkill River. This includes improved access to the river and the extension of the trail to Bartrams Garden. Current projects included the Grays Ferry Crescent which could be bid in December. That project would serve as a gateway to the Grays Ferry Pedestrian Bridge. Syrnick explained that SRDC used its approved consultant selection process to select Ammann & Whitney to perform the conceptual study.

Joe Sullivan then outlined the issues and options (see attached Agenda) for the river crossing and distributed drawings and photos. Critical parameters include the need to provide passage of river traffic, ensure compliance with ADA and meet the physical restraints of the site. The required vertical clearance has yet to be determined. Because of the reduction in river traffic, a reduced clearance could allow for a lower deck for the proposed bridge. As part of its scope of work, A&W will determine the vertical clearances and permitting required, with the assistance of McCormick Taylor. They have engaged AWK to perform the physical survey. It was indicated that retention of the existing railroad truss could be a desirable goal for the project. Reuse of the substructure to support the new superstructure could ease permitting and construction costs and be an interesting adaptive re-use of an existing structure.

Mike Kates suggested that the use of a ferry could be cost effective and eliminate the need to deal with clearance issues. Syrnick asked Kates to provide a rough cost estimate

of a ferry service for consideration. Kates also suggested the use of the active CSX swing bridge south of the proposed crossing. This can be pursued with CSX.

Sarah Stuart asked about a low structure that could be possibly supported on pontoons and opened for passage of large river traffic. She also suggested that a representative of the Forgotten Bottom neighborhood be invited into the review process.

Karen Cilurso asked that SRDC supply documentation of their consultant selection process to DVRPC.

It was agreed that once the physical survey is complete, the vertical clearance requirements are better defined and other options are investigated, the committee would meet again to discuss how to advance the project.

Lane B. Fike P.E.

memo

schuylkill river development corporation

Sept. 27, 2010

to: Invitees, File

from: Lane Fike, P.E.

re: Grays Ferry Crossing Trail Bridge
Crossing Concept Committee Meeting
Sept. 27, 2010 9am to 12 pm Trolley Works Conf. Room

Invitees:

CCC - Louise Turan, Exe. Dir., Bartrams
Debbie Schaaf, Senior Planner - PCPC
Jon Edelstein, Mngr.Brnfld Redev. - Dept of Comm. *
Mike Kates - Trolley Works
Donna Henry - Exc.Dir, S.W. Comm.Dev. Corp. *
Karen Cilurso - Sen.Reg.Planner, DVRPC *
Sarah Clark Stuart - City P&R, Bike Coalition

DesignTeam – Joe Sullivan, Ammann & Whitney
Ahcène Larbi - Ammann & Whitney
Melissa Dimitriou - Ammann & Whitney
Ted Agoos - Agoos/Lovera Architects

SRDC – Joseph R. Syrnick
Lane Fike

* Not Present

Joe Sullivan opened the meeting discussing the parameters of the project. He noted that exisiting Railroad bridge drawings were reviewed. The preferred clearance of 35' was pursued, but the Coast Guard stated that it was very doubtful that approval could be obtained. Vane Brothers tug boats require 50' clearance. The number of bride openings was supplied by Phila. DoS [2007 - 100 times, 2008 - 92 times, 2009 - 59 times, 2010 - 54 times]. The Coast Guard said that since the tug boat was supplying fuel to a power plant that serviced hospitals, the request for a restriction would likely be rejected.

Sarah asked if a movable bridge had been considered so that lower elevation could be used. Joe Syrnick said that the cost, logistics and liability of operating a movable bridge were thought to be unreasonable for this bridge. Sarah asked that we pursue option with Department of Streets. Joe said he would ask and that others make contacts as well if desired. Debbie said she could ask Commerce to give an opinion.

Sarah asked if the bridge could be cantilevered off of the GFA Bridge. It was explained that the 50" clearance no longer allowed for supporting the pedestrian bridge between the GFA Piers. The superstructure was not designed to carry the dead & live loads of a pedestrian bridge supported off of the highway fascia beams.

Sarah was concerned about ramp intrusion on the west bank. Joe indicated that the ramp length would be the minimum and the immediate plan is to follow railroad to 49th Street. Once a trail is established along the river, the trail could link with bridge directly.

It was noted that use of the railroad bridge for a trail has not been formerly requested from CSX. SRDC will consider options for resolving this issue.

Ted Agoos presented several renderings showing the many options considered to date, including the 35’ Clearance options. There were detailed renderings of the Options 3 & 4 which were believed to represent the most viable alternatives.

The consensus of those present was that Option three (3) was probably the most attractive. Option 4 with the truss and cable-stayed structure seemed cluttered.

The Project Team will take a closer look at the trail approaches and likely make a recommendation for a structure utilizing the existing railroad bridge. They will also seek additional funding for preliminary design of a structure that utilizes the existing Railroad bridge.

Lane B. Fike P.E.

September 29, 2010

Clarena Tolson
Streets Commissioner
720 Municipal Services Building
1401 JFK Blvd.
Philadelphia, PA 19107

Re: Schuylkill Crossing at Grays Ferry

Dear Commissioner Tolson,

The Schuylkill River Development Corporation (SRDC) is working on the concept of a Schuylkill River crossing in the vicinity of Grays Ferry to carry the Schuylkill trail over the river. The focus of this study is an adaptive re-use of an abandoned railroad swing bridge located just south of the Grays Ferry Avenue Bridge.

It would be advantageous to have the river crossing made at an elevation as close as possible to the existing swing bridge. However, at this elevation there is low vertical clearance over the river such that a moveable bridge would be needed to accommodate current navigation by commercial river traffic.

SRDC, and our concept development team, would like to explore with you the possibility of constructing a moveable bridge at this location. While SRDC would be responsible for securing the capital cost of this structure, we are not in a position to operate and maintain it. These tasks, we believe are something that would more appropriately fall to the City. We note that the City currently operates the 34th Street Bridge (aka University Avenue) which is just upstream from our proposed site.

Could we meet with you and your operations team to present our proposal and discuss how we might proceed? As you know the development of the Schuylkill trail is a high priority of the City Administration and this river crossing is a critical link which will connect the trail to Bartram's Garden.

If you could provide some dates and times for such a meeting, we should appreciate it.

Sincerely,

Joseph R. Syrnick
President & CEO

cc: Kevin Koch

CITY OF PHILADELPHIA

STREETS DEPARTMENT
7th Floor - Municipal Services Building
1401 JFK Boulevard
Philadelphia, Pennsylvania 19102-1676

CLARENA I. W. TOLSON
Commissioner

November 9, 2010

Joseph R. Syrnick
President and Chief Operating Officer
Schuylkill River Banks
2929 Arch St. – 13TH Floor (Cira Center)
Philadelphia, PA 19104-7391

RE: Swing Bridge over the Schuylkill River

Dear Mr. Syrnick:

Thank you for meeting with the Department of Streets to discuss your vision for the extension of the Schuylkill River Trail by utilizing an abandoned rail road swing bridge over the Schuylkill River. In your September 29, 2010 letter you suggested that the Schuylkill River Development Corporation (SRDC) would refurbish the swing bridge and that the City of Philadelphia Streets Department would operate and maintain it.

We support SRDC's mission and share its vision for a safe and convenient bicycle and pedestrian connection to Bartram's Gardens. In our service focus, the Streets Department does not have the resources to operate and maintain a swing bridge. The SRDC may need to seek another entity for these services or that you explore utilizing other crossings to connect Bartram's Gardens to the Schuylkill River Trail.

Good luck in your endeavors and thank you for all that you do.

Sincerely,

Clarena

Clarena I.W. Tolson
Streets Commissioner

c: Stephen Buckley, Deputy Commissioner of Transportation Branch
David J. Perri, Surveys and Design

Sullivan, Joseph

From: Lane Fike [lane.fike@srdc.net]
Sent: Monday, January 24, 2011 9:21 AM
To: Joseph Syrnick
Cc: Sullivan, Joseph
Subject: comments

We recd comments from Louise, Sarah & Debby. None from Mike, Karen, Donna & Jon.

Louise had no comments. Debby asked for some changes but favors #3. Sarah wants lower bridge.

DoS was very adamant that they did not want a movable bridge.
I suggest we should incorporate Debby's comments in final report and send to all members.
Indicate that we are moving forward with Option 3 Preliminary Design.

Lane B. Fike P.E.

Schuylkill River Development Corporation
2929 Arch Street 13th Floor
Philadelphia PA 19104-7395
215-222-6030 ext.101


Grays Ferry Crescent
Grays Ferry Ave.
Proposed Crossing
Bartrams
© 2008 Sanborn
© 2008 Tele Atlas

Sullivan, Joseph

From: Debby.Schaaf@phila.gov
Sent: Friday, January 21, 2011 5:16 PM
To: Lane Fike
Cc: Donna@southwestcdc.org; Edelstein Jon; Joseph Syrnick; Sullivan, Joseph; Cilurso, Karen P.; Turan Louise; Kates Michael; sarah@bicyclecoalition.org
Subject: Re: Conceptual Report
Attachments: pic16512.gif

Lane,

Here are my comments on the report:

- Figure 1 should be more detailed in showing the existing bridge and existing and planned trail sections.
- Truss Concept 3 and Cable Concept 1 both should mention as advantages the fact that they would give prominence to an artifact that gives insight into the history of the river.
- The aesthetic comments on the alternative designs are subjective and should not be grouped with more factual statements. For example, I think that the "difference in truss span and depth" in Truss Concept 2 is more attractive than the "more consistent look" of Truss Concept 1.
- As I recall the stakeholder meeting in September, and according to the meeting notes in the Appendix, there was not a consensus second choice after Truss Concept 3. I was the person who made the comment about Option 4, Cable Stay Concept 1, being a bad mixture of old and new, and I don't remember hearing the arguments in favor of it. (I saw a lot of pictures of Option 5 and had the impression that was the favored option coming into the meeting.) I continue to think Option 4 is a poor option. If you look at the advantages and disadvantages of these two options, as laid out in the report, they are almost exactly the same. If re-using the existing truss proves workable, we should use Option 3. If it proves unworkable for whatever reason, then we should consider Option 5 or Option 6.

Deborah Schaaf
Philadelphia City Planning Commission
One Parkway Building, 13th floor
Philadelphia PA 19102

Phone: 215-683-4643
Fax: 215-683-4630
debby.schaaf@phila.gov

"Lane Fike" <lane.fike@srdc.net>

"Lane Fike" <lane.fike@srdc.net>

12/23/2010 04:09 PM

To "Turan Louise" <lturan@bartramsgarden.org>, "Kates Michael" <mkatesptw76@aol.com>, <sarah@bicyclecoalition.org>, "Cilurso, Karen P." <kpcilurso@dvrpc.org>, <Debby.Schaaf@phila.gov>, <Donna@southwestcdc.org>, "Edelstein Jon" <jon.edelstein@phila.gov>

cc "Joseph Syrnick" <joseph.syrnick@srdc.net>, "Sullivan Joe" <JSullivan@Ammann-Whitney.com>

SubjectConceptual Report

Dear Crossing Concept Committee Team Member…

Amman & Whitney has submitted the pre-final report for the feasibility study of a Schuylkill River Crossing at Grays Ferry. The report as presented has a draft recommendation on page 14.
We are seeking your comments prior to finalizing the report and we may need to do a bit more inspection of the existing truss to assure that it is re-usable.
We recognize that this is a busy time of year but could we get your comments by January 21, 2011?
We appreciate your work on this project and hope that you have a great holiday.

Lane B. Fike P.E.

Schuylkill River Development Corporation
2929 Arch Street 13th Floor
Philadelphia PA 19104-7395
215-222-6030 ext.101
[attachment "Grays Ferry Ped Bridge Conceptual pdf Report to Stake Holders.pdf" deleted by Debby Schaaf/CityPlan/Phila]

Thursday, September 29, 2011

Joseph Syrnick
Lane Fike
SRDC

Dear Joe and Lane,

Thank you for the opportunity to comment on this report.

I appreciate participating as a stakeholder for this feasibility study and I did concur with the rest of the group on the design of the bridge section. However, I still do not agree that the bridge should be 50 feet high. I recommend that SRDC work with other partners (including the Bicycle Coalition and other trail advocates) to pursue finding a way to make it possible for a bridge to be constructed as close as possible to grade level or be built as a movable bridge to allow ship traffic as necessary, instead of being 50 feet high.

The height restriction is driving the designs for this bridge to be higher, with steeper slopes and probably more expensive than what is expected of this bike/ped crossing. Given that it is imperative that the trail cross the river over the western riverfront, finding a design that fits into the City's physical landscape and into the needs of the Schuylkill River Trail, we strongly recommend that alternatives be pursued. We recognize that maintenance is a barrier, but we are convinced that more could be done to determine if that barrier could be overcome.

Although Commissioner Tolson's letter states that the City doesn't have the resources to operate and maintain a moveable bridge, the letter did not reject it outright as a concept. She suggested seeking another entity for those services.

We have several ideas or questions about operating and maintaining a new movable bridge or re-activating the existing swing bridge.

- Is it possible to get a rough idea of the cost of operating and maintaining a movable bridge? (For example, how much does the City spend on the University Avenue Bridge?). If the amount is reasonable, isn't it conceivable that the funds to operate and maintain the bridge could be raised and that the operation and maintenance could be contracted out to a third party? Even if it has to be opened 30-50 times a year, couldn't someone be hired on a contractual basis for those several hours of 30-50 days? For that matter, couldn't a fund be created to pay for the cost of the additional work for the city employee who operates the University Avenue Bridge?

1500 Walnut Street, Suite 1107 · Philadelphia PA, 19102 · p: (215) BICYCLE · f: (215) 220-3004 · www.bicyclecoalition.org

- Could a remote operation be explored? Conceivably, if and when the University Avenue Bridge has to be raised, couldn't the city's operator raise the Gray's Ferry Crossing remotely? I realize this requires additional safety measures to ensure that no one is on the bridge at the time it needs to go up, but couldn't that be handled with cameras and gates? Couldn't the cost of installing the equipment necessary to operate remotely be built into the capital costs of the construction?

- How frequently does the CSX RR bridge open south of the study area? Is it opened remotely or by an operator? Is it possible that CSX could be contracted with to open the bridge (either manually or remotely)?

The reasons we prefer a new movable bridge or reactivated swing bridge are as follows.

1) **Approaches to a 50 foot high bridge will be long, steep and high.** As proposed in the feasibility study, the approach to the bridge on the eastern bank of the bridge would begin at 36th Street (the FedEx driveway) and rise up to the 50 foot level. (According to Google Earth), the ramp would be approximately 880 feet to the eastern bank. On the western side, the ramp down from the bridge will curve to the south and run along the CSX tracks and could be approximately 1400 feet long.

2) **A steep approach will mitigate green space access.** These proposed ramps lengths and steep slopes will discourage people from making the effort to cross the River, especially short-distance bicyclists from southwest who wish to connect to Center City and the rest of the Schuylkill River Trail. Extending the Schuylkill River Trail to Southwest Philadelphia should be opening up green space to a population that currently doesn't enjoy that access. A 50 foot high bridge could potentially act as barrier to that access. I'm also concerned that the eastern approach will have such a steep slope that it will become a turnaround area as opposed to an invitation to cross the River.

3) **Lower bridges are easier to navigate and more inviting.** As mentioned above, we're concerned that a bridge with a steep grade will be an effective barrier to those who just don't feel they can manage the climb (whether on a bike or walking) or who have vertigo. A bridge closer to the water has a more intimate feel, a feeling of closeness to the riverbanks and that you are part of the River, as opposed to flying over it. What is appealing about a lower bridge that moves to accommodate river traffic is its proximity to the water and it's singularity of use.

4) **Proposed western approach would shoehorn industrial development closer to the River.** The proposed long ramp on the western side of the River is situated in CSX's right of way. What if PIDC was considering using this ROW to augment the National Heat and Power (NHP) property for its industrial development plans for its site? Presumably, if the ramp is placed on the CSX ROW and PIDC can no longer get access to it, the area available for industrial development would be smaller and force that development closer to the River. PIDC's Infill Project anticipated a bridge that is effectively at-grade with much lower and shorter approaches and a tie in directly into the riverfront path.

5) **The space for a riverfront trail is being made available now.** I have learned that PIDC and Dept. of Parks and Recreation are in the process of negotiating the transfer of 5 acres of land along the river to make it available for a riverfront trail. (It was announced on December 7th when Green2015 was launched and I learned at last night's Park and Rec. Commission meeting that Mark Focht is charged with moving forward on the transaction; so this is moving. I got the sense from the announcement made at the Park and Rec. Commission meeting that DPR is touting this transaction as the beginning of its effort to work towards the 500 acre goal.) It is our understanding that PIDC wants to keep the public as close to the river as possible to keep them separated from the industrial sections of the NHP site. The current ramp proposal doesn't anticipate the riverfront path; it is designed for the CSX ROW only. Given that the transaction is close at hand, and that DPR is going to make this 5 acres part of its Greenworks 500 acres of new park land goal, shouldn't the design of the bridge tie into the riverfront parcel now?

On behalf of the Bicycle Coalition, I recommend the following.

- SRDC continue to explore and cost out movable bridge technologies for a bike/ped bridge. (This link is intriguing Bridge of Scottish Invention (designed by Bennett)). We suggest inviting bridge engineers from several local firms to review the report and ask them for their ideas on options for a movable bridge that meets the criteria of minimal operation and maintenance costs. Perhaps Bennett could be asked to provide some kind of cost estimate.

- We strategize with you on meeting with Trigen and/or the tugboat company about the height issue.

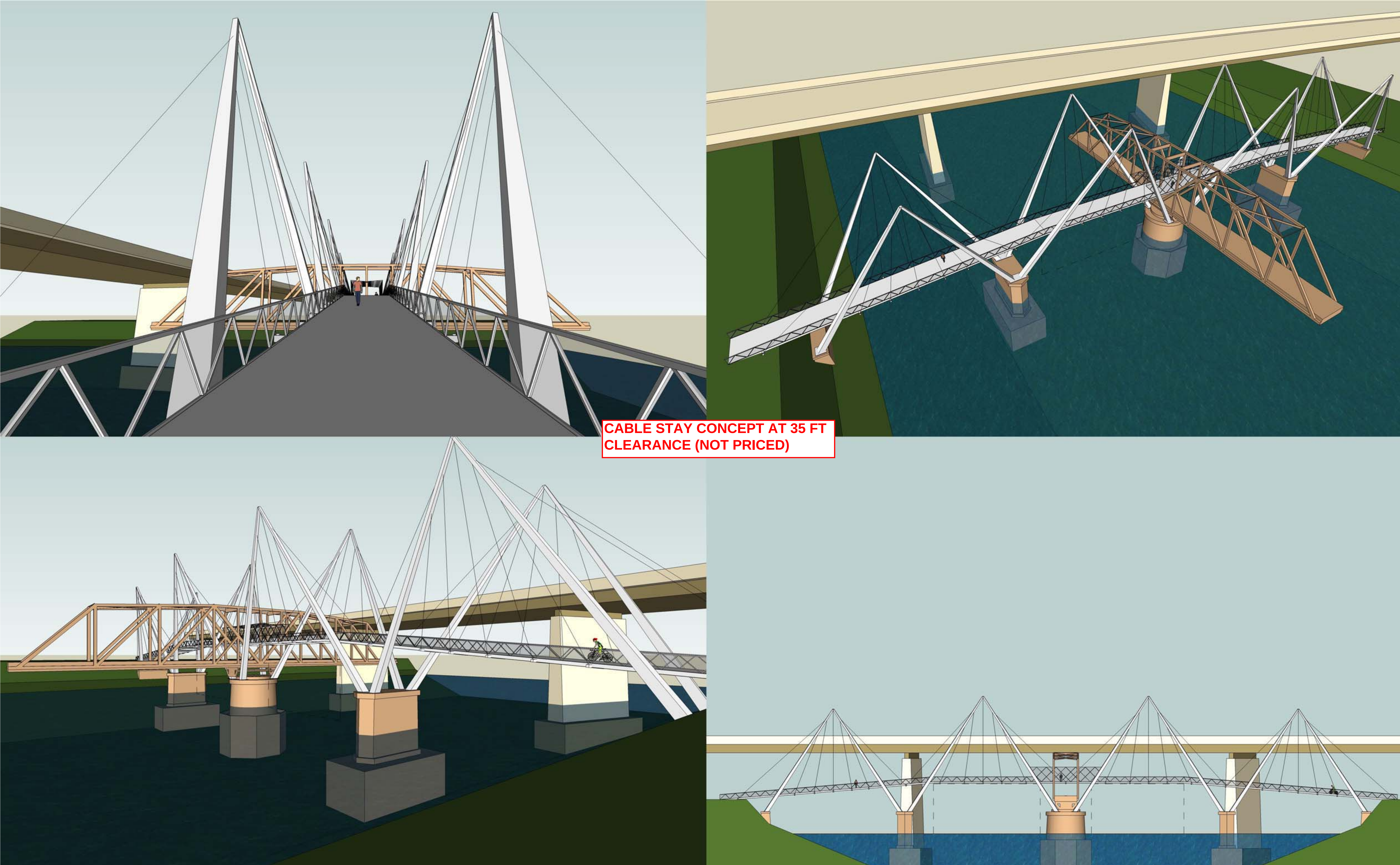
- The Bicycle Coalition and other members of the Complete the Trail Coalition meet with the Streets Department and Mayor's Office of Transportation to discuss the moveable bridge concept.

- We would like to join you at a meeting with PIDC and the Parks and Recreation Department to discuss how the bridge will fit into their plans for the riverfront trail.

I look forward to further discussing our recommendations this with you.

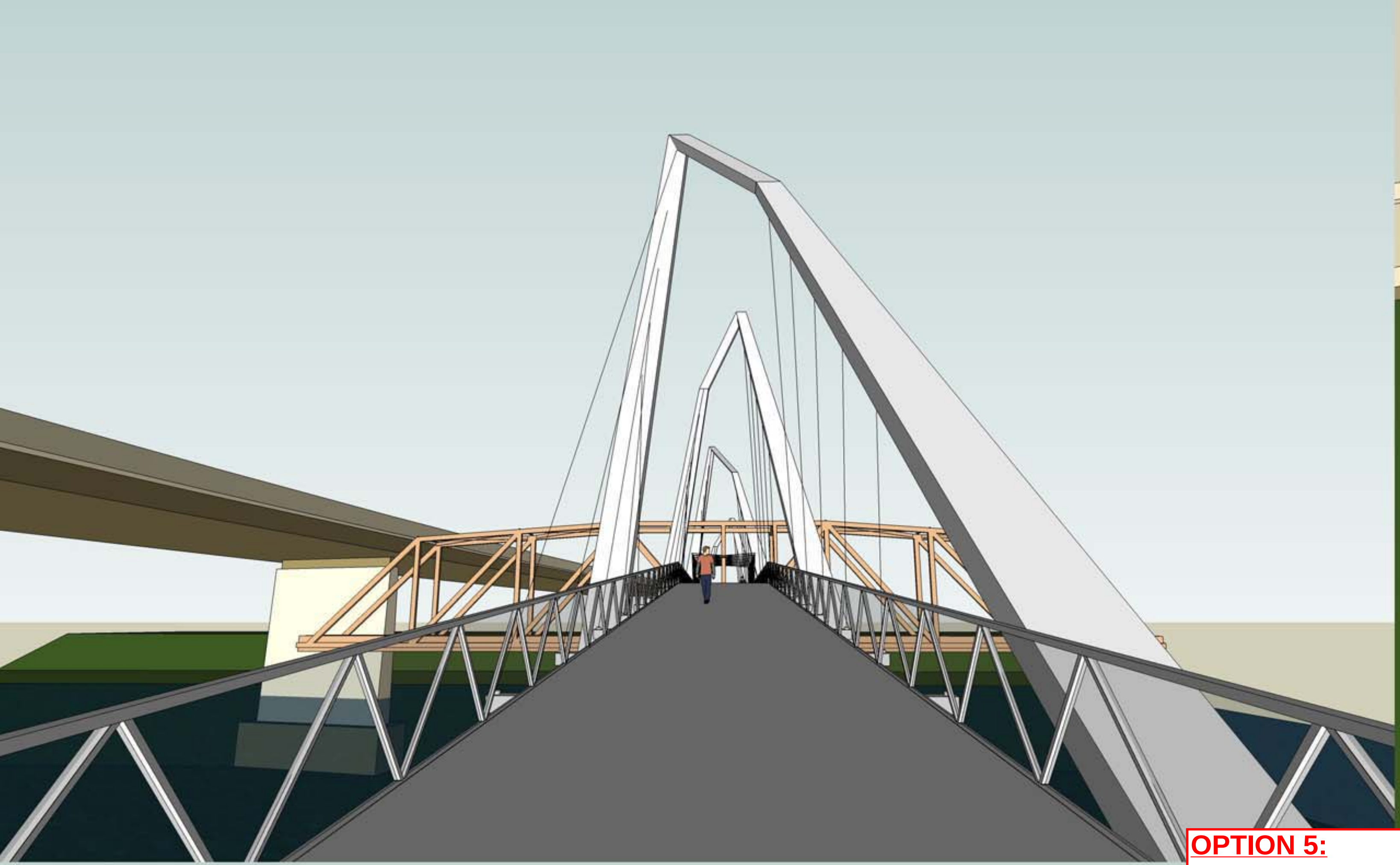
Sincerely,

Sarah C. Stuart
Campaign Director

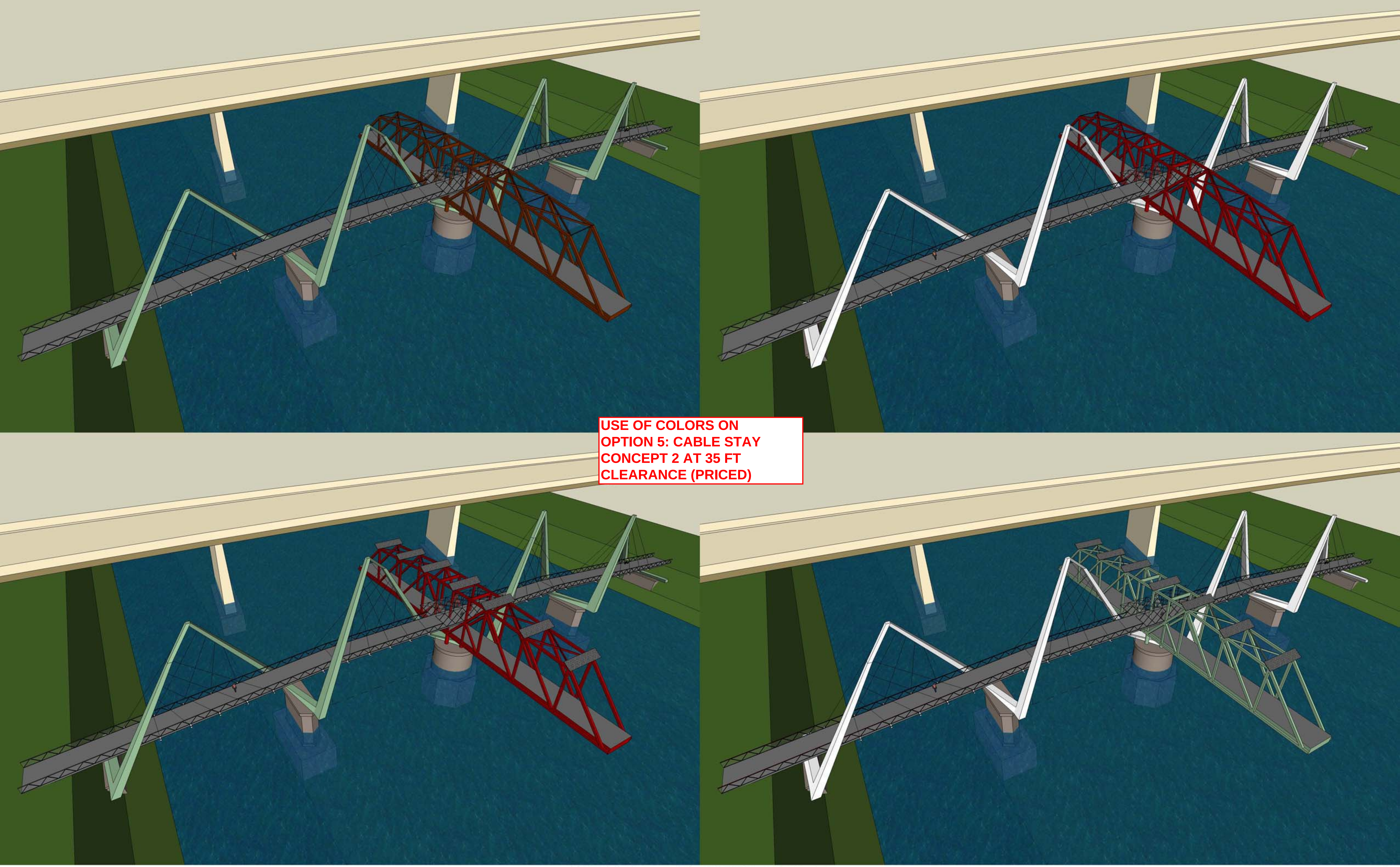

CABLE STAY CONCEPT AT 35 FT CLEARANCE (NOT PRICED)

OPTION 3:
CABLE STAY CONCEPT 1 AT 35 FT CLEARANCE (PRICED)

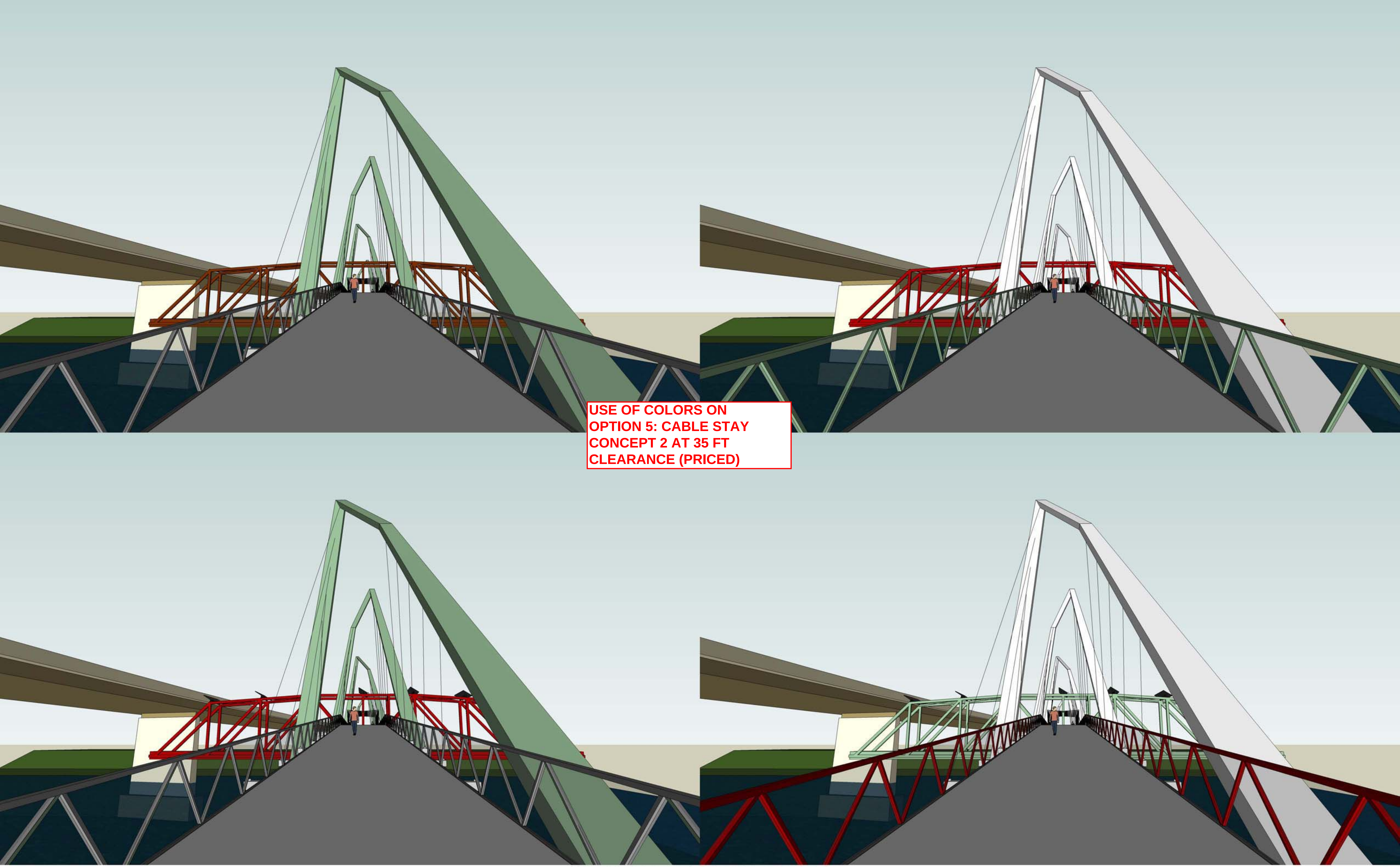
CABLE STAY CONCEPT AT 35 FT CLEARANCE (NOT PRICED)



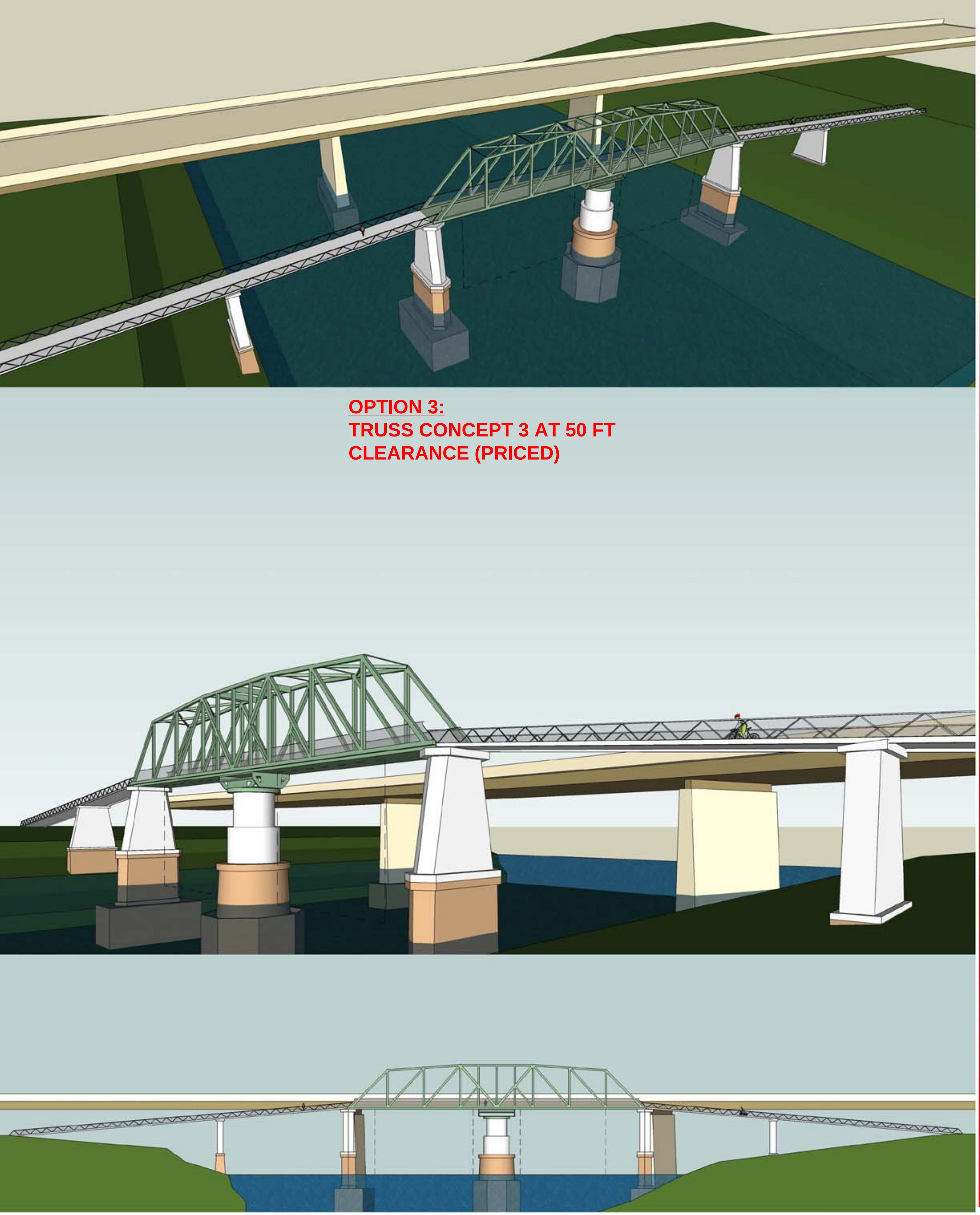
OPTION 5:
CABLE STAY CONCEPT 2 AT 35 FT CLEARANCE (PRICED)



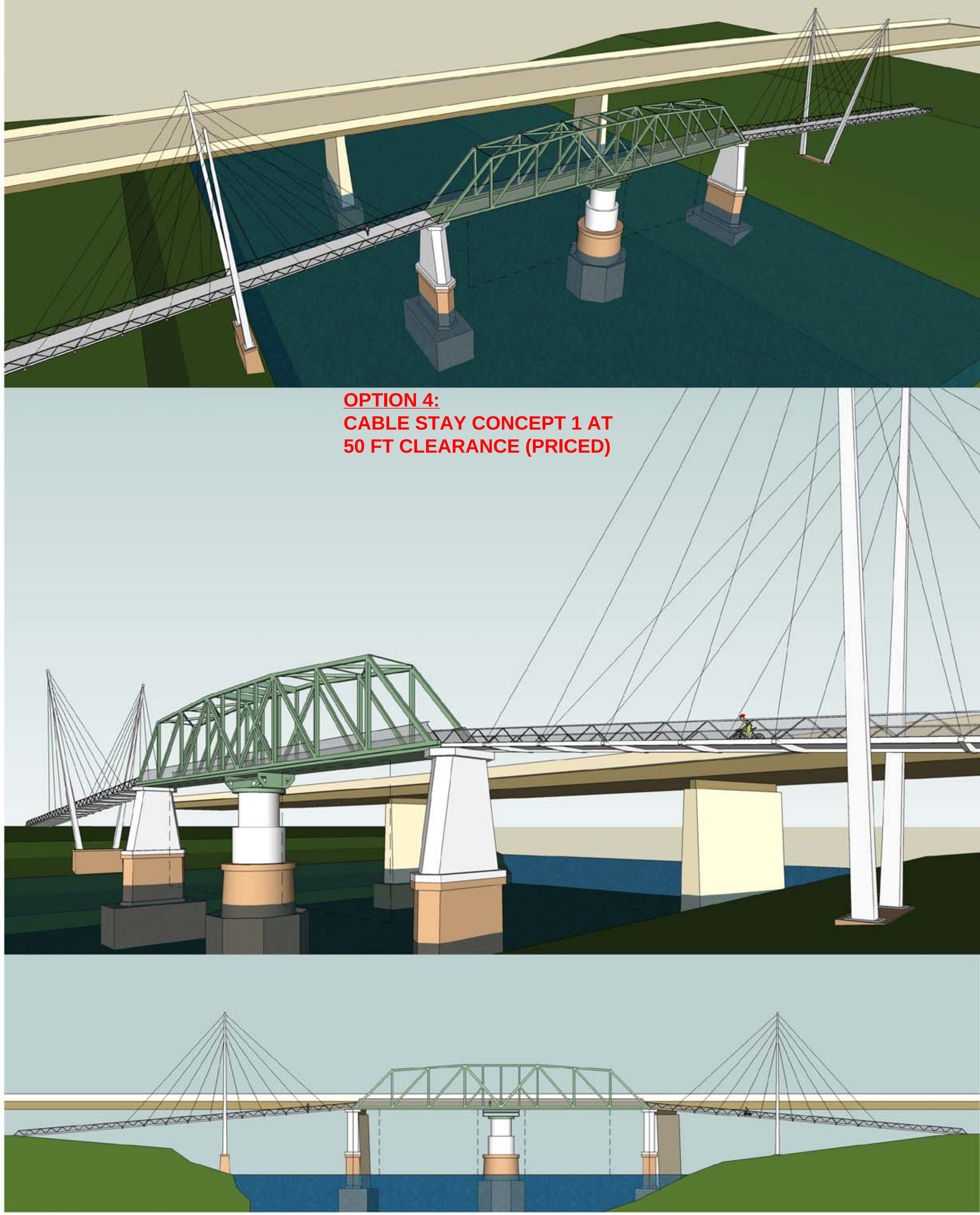
USE OF COLORS ON
OPTION 5: CABLE STAY
CONCEPT 2 AT 35 FT
CLEARANCE (PRICED)



USE OF COLORS ON OPTION 5: CABLE STAY CONCEPT 2 AT 35 FT CLEARANCE (PRICED)



OPTION 3:
TRUSS CONCEPT 3 AT 50 FT CLEARANCE (PRICED)



OPTION 4:
CABLE STAY CONCEPT 1 AT 50 FT CLEARANCE (PRICED)

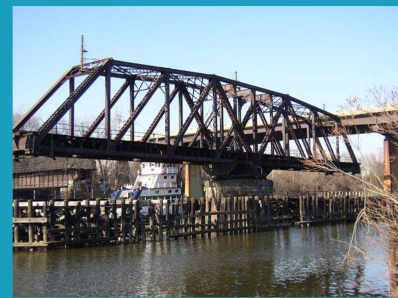
SCHUYLKILL BANKS PEDESTRIAN BRIDGE

Ammann & Whitney | Agoos/Lovera Architects for Schuylkill River Development Corporation

9.27.2010

Schuylkill River Development Corporation

Public Open House



Please join us to learn about two exciting projects for the Schuylkill Banks

Preliminary findings of the **Concept Studies Report for the Grays Ferry Pedestrian Bridge over the Schuylkill River**. &

Current status of the **West Bank Schuylkill River Trail Feasibility Study**.

Wednesday, February 08, 2012
Penn Museum
Rainey Auditorium
6:00 – 7:45 p.m.

Penn Museum is located at 3260 South Street, Philadelphia, PA 19104 at the intersection of Spruce Street and 33rd Street

WEST BANK SCHUYLKILL RIVER TRAIL FEASIBILITY STUDY
Potential Ideas for Trail Locations

PLAN PHILLY

Schuylkill River Trail Public Meeting

Home » Event

February 8, 2012 - 6:00pm - 8:00pm

Information on the trail

Location

Rainey Auditorium, Penn Museum, 3260 South Street
Philadelphia, PA, 19104

Tags: Bicycling Development Environment & Sustainability University City University of Pennsylvania Coalition

PlanPhilly.com is a project of PennPraxis, the clinical arm of the School of Design of University of Pennsylvania. **MORE**

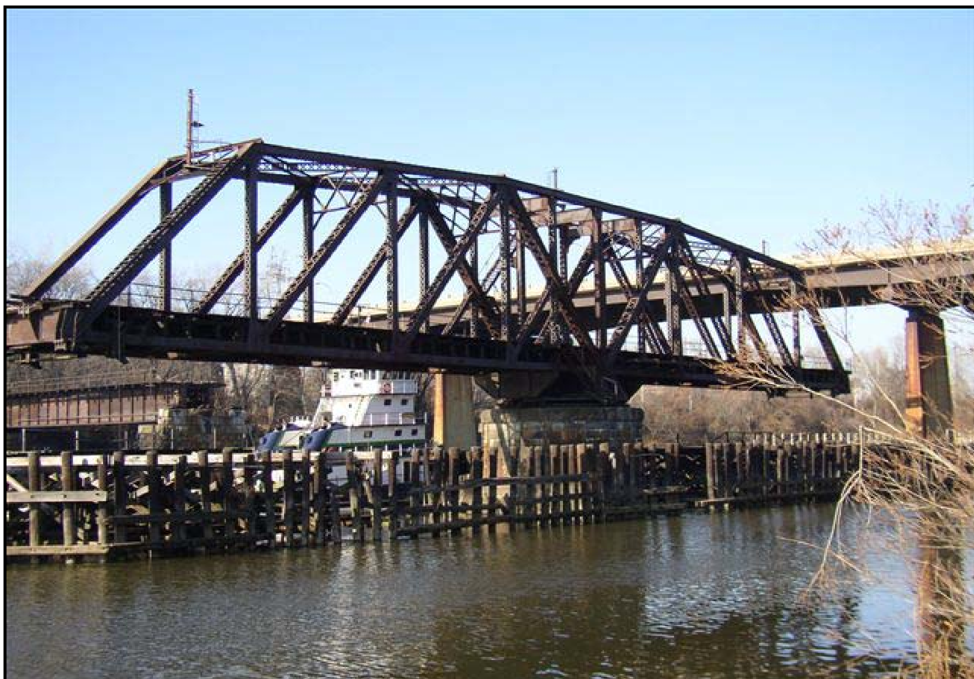
APPENDIX G

(Inspection Report)

Schuylkill River Development Corporation

Conceptual Design Services for
Grays Ferry Pedestrian Bridge, Philadelphia, PA
Project No. GFP-1

Inspection Report



Grays Ferry Pedestrian Bridge
over
The Schuylkill River

PREPARED BY:

AMMANN & WHITNEY

September 2011

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

TABLE OF CONTENTS

I. LOCATION MAP 1

II. AERIAL VIEW 2

III. EXECUTIVE SUMMARY 3

IV. EXISTING STRUCTURE INFORMATION 4

1. LOCATION & SURROUNDINGS: 4
2. SUPERSTRUCTURE: 4
3. SUBSTRUCTURE: 4
4. MECHANICAL: 4

V. IN-DEPTH INSPECTION FINDINGS 5

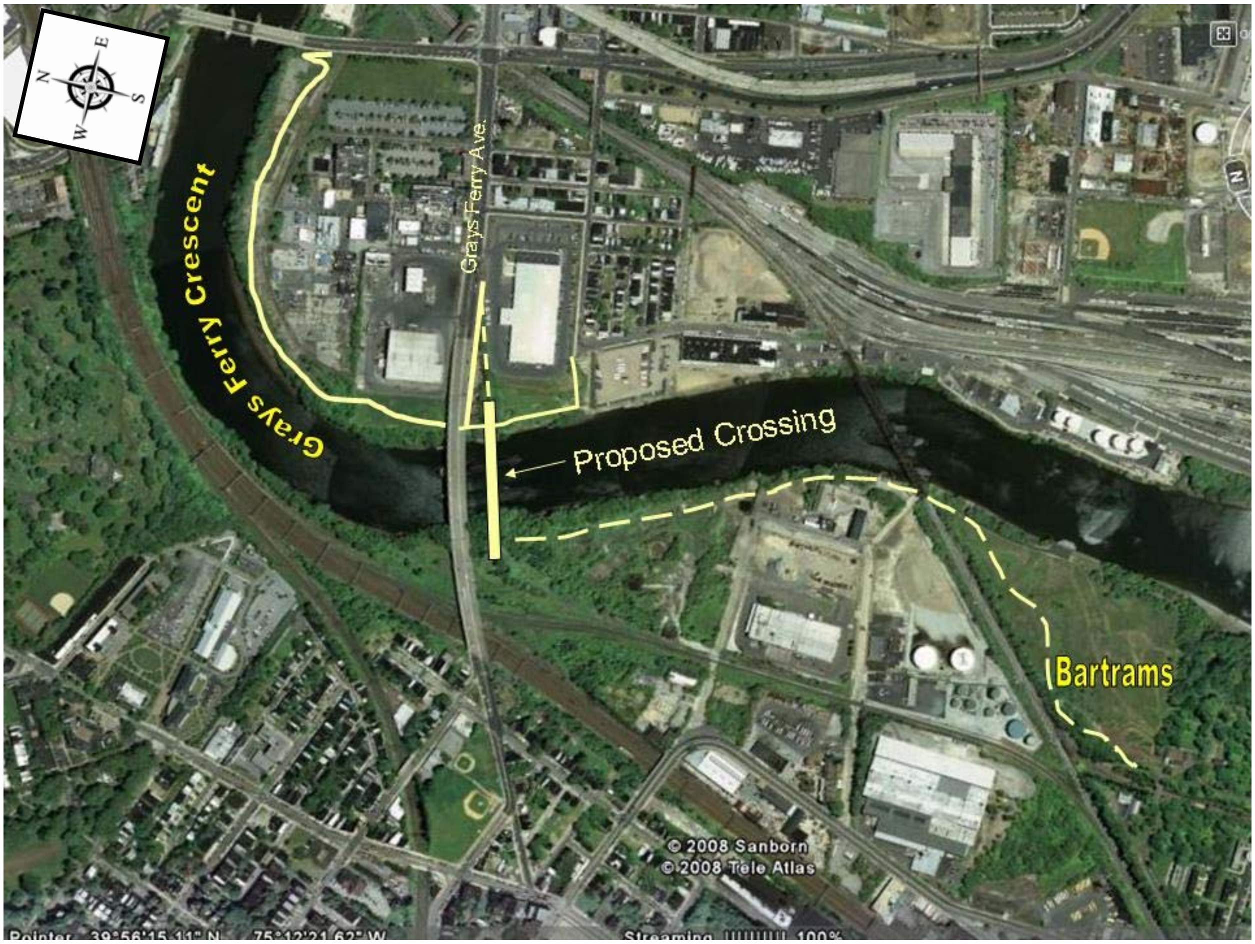
1. GENERAL: 5
2. SWINGSPAN TRUSS: 5
3. STRINGERS: 7
4. FLOORBEAMS: 8
5. BOTTOM CHORD CROSS BRACING: 8
6. TOP CHORD CROSS BRACING: 9
7. PORTALS: 9
8. MECHANICAL SYSTEM STRUCTURAL COMPONENTS: 9
9. FENDER SYSTEM: 10
10. ABUTMENTS & WINGWALLS: 10
11. RETAINING WALL: 10
12. PIERS: 11

APPENDIX A: Figure 1: Truss Node Designations

APPENDIX B: Inspection Photographs

I. Location Map

II. Aerial View



III. Executive Summary

The objective of the inspection and this report was to list all structural defects needed to evaluate applicable superstructure and substructure repairs.

An in-depth inspection was performed between June 21 and June 23, 2011 to assess the existing structural condition of the bridge. No existing inspection reports were available. The railroad and mechanical systems were not inspected as they will be removed during the rehabilitation.

Overall, the bridge was in fair to poor condition. The structural integrity of the superstructure has not been compromised; however, the extent of steel repairs needed to extend the life of the structure will be costly. The superstructure steel had many areas of severe deterioration below the deck rails, particularly in bottom chords, gusset plates, and lateral bracing. The substructure stone abutments and piers had minimal areas of concern. The concrete retaining wall at the north end of the East Approach had several areas of deteriorated and spalled concrete. The paint system has failed throughout the entire superstructure with moderate to severe surface rust typical.

IV. Existing Structure Information

1. Location & Surroundings:

The proposed pedestrian bridge is located adjacent to the existing Grays Ferry Avenue highway bridge over the Schuylkill River. The proposed bridge, which is in the location of the abandoned Conrail swing bridge, will serve as a key connection in the Schuylkill Banks trail. The Schuylkill Banks trail stretches between the Art Museum and Locust Street, and there are several sections under design south of Locust Street. The ultimate goal of the Schuylkill River Development Corporation (SRDC) is for the trail to continue down the east bank of the river to Grays Ferry and then cross over to the west bank to enable a connection to Historic Bartram's Garden and ultimately to Fort Mifflin.

2. Superstructure:

The existing structure, which was built in 1901, consists of four spans over the Schuylkill River. Each 97'-9 3/8" approach span is made-up of two 8'-6" deep steel plate girders. The existing 226'-3" long swing steel truss is currently supported in the open position at midspan with two equal cantilever spans. The bridge carried one non-electrified freight line. The truss is permanently in the open position since the structure and rail line were abandoned by its owners. It is assumed and very likely that the mechanical systems do not function anymore.

3. Substructure:

Both abutments and all three piers are constructed of stone masonry. The breastwall of the West Abutment and all three piers were in the water. The East Abutment was outside of the waterway along the river bank.

4. Mechanical:

The mechanical systems were not inspected as a part of this inspection. They will be removed during the rehabilitation. The girder supports below the truss bottom chord were inspected for structural defects only.

V. In-Depth Inspection Findings

1. General:

Ammann & Whitney, Inc. performed an in-depth inspection of the entire bridge structure between June 21 and June 23, 2011 to assess the existing condition of the bridge (Photos 1.1 to 1.5). The inspection of the West Abutment, piers, and truss utilized a bucket boat from above the waterline.

The field inspection consisted of a hands-on examination of the bridge to determine the extent of structural deterioration. Field notes, sketches, and photographs were used to record all observations. A Structural Inventory and Appraisal (SI&A) value was assigned to each element of the bridge to designate the degree of deterioration. It is noted that the inspection did not cover every single defect but enough to have a good representation of the general condition of the structure.

Note that the abutments and piers were numbered from west to east. The truss elements were numbered from the north (upstream) and south (downstream). See Figure 1 for truss node designations. The truss was in the open position during the inspection.

2. Swingspan Truss:

Overall, the swingspan was in fair to poor condition (SI&A 5/4).

a. General Notes:

- Overall, the paint system had failed with no paint remaining. The entire structure, at minimum, had surface rust and minor pitting.
- The areas with the most corrosion were located at node points, particularly at the gusset plates in the bottom chord.
- Any horizontal flat area below the bottom chord had some degree of delaminated rust buildup.
- Minor to moderate pack rust between flange plates was typical at the bottom chord field splices.
- Minor to 100% section loss in the chord lacing bars at the connection to the chord channels (Photos L.1 to L.3). Pack rust has caused numerous lacing bars to bow (Photo L.4).

b. Truss Bottom Chords:

- Bottom Chord Members:
  - (L0-L1)$_{W\_US}$: Moderate delaminated rust of top flanges at node L1$_{W_US}$ (Photo BC.1).
  - (L4-L3B)$_{W\_US}$: Bottom tie-plate broken in half due to deterioration immediately north of gusset plate at node L4$_{W_US}$ (Photos BC.2 & BC.3). The tie-plate north of the broken plate was also severely deteriorated. Both bottom flanges of the channels were severely knife edged up to 3’-6” north from node L4$_{W_US}$.
  - (L3B-L3)$_{W\_US}$: Top flange tie-plate had 100% section loss and severe delamination throughout adjacent to L3$_{NW}$ (Photo BC.4).
  - (L3B-L3)$_{W\_US}$: Bottom flange severe pitting with section loss 1’-0” long from edge of gusset at node L3$_{W_US}$.
  - (L3-L3B)$_{W\_DS}$: 2’-5” long x 5” high hole in the east channel web above the gusset plate at the south side of L3B$_{W_DS}$ (Photo BC.5). The bottom flange had severe deterioration and section loss at the same location (Photo BC.6). 4” wide x full height severe deterioration

in the east channel web immediately adjacent to the south side of $L3_{BSW\_DS}$.
- (L3-L3B)$_{W\_DS}$: Heavy pitting 1½" wide x 1'-3" high (full height) with a 1½" wide x 3" high hole in the west channel web immediately south of the gusset plate at node $L3B_{SW\_DS}$ (Photo BC.7).
- (L3-L3B)$_{W\_DS}$: Three (3) broken lacing bars due to corrosion immediately south of the gusset plate a node $L3B_{W\_DS}$ (Photo BC.8).
- (L3-L4)$_{W\_DS}$: Bottom tie-plate severe deterioration immediately south of node $L4_{SW}$ (Photo BC.9). Seven (7) bottom flange lattice bars broken, necked down, or bent at same location.
- (L3-L4)$_{W\_DS}$: Top tie-plate severe deterioration and warping due to pack rust immediately south of node $L3B_{SW}$. Same condition for tie-plate north of node $L4_{W\_DS}$.
- (L3-L4)$_{E\_DS}$: 9" x 9" hole in west channel web at $L3_{E\_DS}$ (Photo BC.10).
- (L3-L4)$_{E\_DS}$: 2'-0" long x 8" high hole in the west channel web above the gusset plate at the south side of $L3B_{E\_DS}$ (Photos BC.11 & BC.12). The following bullet below describes similar holes at the same node point.
- (L3-L4)$_{E\_DS}$: 2'-0" long x 6" high hole in the west channel web above the gusset plate at the north side of $L3B_{E\_DS}$ (Photo BC.13). There was also a 2"x2" hole in the web 2'-0" north of the hole at the gusset (Photo BC.14). The 2'-0" length between holes had heavy pitting on the inside on the back face of the web.

- Bottom Chord Splice Plates:
  - (L0-L1)$_{W\_US}$: Splice plates at $L1_{W\_US}$ bowed along outside edge due to ¼" pack rust.
  - (L2-L3)$_{W\_US}$: Splice plates at $L3_{W\_US}$ bowed along outside edge due to ½" pack rust (Photo SP.1).
  - (L2-L3)$_{W\_DS}$: Splice plates at $L3_{W\_DS}$ bowed along outside edge due to ½" pack rust. Top plate had a popped rivet head due to the stress created by the pack rust (Photo SP.2).
  - (L0-L1)$_{E\_DS}$: Splice plates at $L1_{E\_DS}$ bowed along the outside edges due to ¾" max pack rust (Photo SP.3).

- Bottom Chord Gusset Plates:
  - Gusset plates and corresponding cross bracing were generally in worse condition in areas with timber planking walkways spanning between floorbeams. The planks held moisture against the gussets (Photo GP.1).
  - $L0_{W\_US}$: Delaminated rust, including ten (10) rivets, along the bottom 6" height of the east vertical gusset plate connecting the bottom and diagonal chords (Photo GP.2).
  - $L1_{W\_US}$: Large accumulation of delaminated rust atop the gusset plate at southeast corner adjacent to crossbrace (Photo GP.3). Typical in several locations.
  - $L2_{W\_US}$: Large accumulation of delaminated rust atop gusset plate at southeast and northeast corners adjacent to crossbraces (Photo GP.4).
  - $L3_{W\_US}$: 100% section loss 1'-6" wide x 4" long on the south edge and 1'-0" long x 4" wide on the southeast edge (Photo GP.5).
  - $L3B_{W\_US}$: Severe delaminated rust with 100% section loss 1'-0" long x full width of bottom chord at the north and south edges (Photo GP.6).
  - $L4_{W}$: Severe pitting and corroded rivets throughout plate (Photo GP.7). Two 3"x3" holes at the top of the plate. Timbers were resting at the location of the holes indicating trapped moisture led to the deterioration.

- $L2_{W\_DS}$: Popped rivet due to 1” thick pack rust between gusset plate and bottom chord (Photo GP.8)
- $L3B_{W\_DS}$: Severe delaminated rust at south end 1’-0” long x 2’-0” wide. 7” long x 9” wide hole at the edge of the gusset adjacent to the chord (Photo GP.9).
- $L3B_{E\_US}$: 6”x6” hole at the south end of the gusset below the chord (Photo GP.10).
- $L3B_{E\_US}$: 2’-0” long x 1’-2” wide severe delaminated rust with section loss below the chord at the north end of the gusset. 3” long x 9” wide area at north end below a wooden timber support. 6”x6” delaminated area at northwest corner; slightly bent due to ½” pack rust (Photo GP.11).
- $L4_{E}$: Several holes through the vertical gusset plate (Photo GP.12 & GP.13).
  - From north to south:
    - 1¼” wide x 1’-6” high, 1’-9” from the bottom
    - 8” wide x 10” high, 1’-4” from the bottom
    - 5” wide x 8” high, 1’-9” from the bottom
    - 8” wide x 9” high, 1’-7” from the bottom
    - 1¼” wide x 1’-9” high, 1’-7” from the bottom.
  - Severe accumulation of delaminated rust behind the gusset plate.
- $L1_{E\_DS}$: Delaminated rust at north end 1’-0” long x 2’-6” wide (full width). Included within this area was a 4” long x 9” wide and 2” long x 6” wide severely delaminated area up to 100% section loss (Photo GP.14). The south end had a 6” long x 4” wide hole adjacent to the chord and a 1’-0” x 1’-0” area of 35% section loss below the chord.
- $L2_{E\_DS}$: Severe delaminated rust at north end 1’-0” long x 2’-6” wide (full width).
- $L3_{E\_DS}$: Severe delaminated rust with section loss at north end 1’-0” long x 1’-0” wide (Photo GP.15). Also see Photo GP.12 above.

c. Truss Verticals

- $(L3\text{-}U3)_{E\_US}$: ½” pack rust between top of gusset and east vertical channel at node $L3_{E\_US}$.
- $(LM\text{-}MC)_{W\_DS}$: 3” high x full width hole in the south flange of the west channel at the base of the vertical at LM_{W_DS} (Photo V1.1). Bottom two (2) lacing bars 100% section loss and five (5) lacing bars with severe section loss.

d. Truss Diagonals

- $(L0\text{-}U1)_{W\_US}$: Six (6) missing rivets where bridge name plate was attached to chord.
- $(L4\text{-}U3)_{W\_US}$ & $(L4\text{-}U3)_{W\_DS}$: 1’-4” knife edging along the horizontal leg of the top flange angle for both diagonals at L4 (See Photo GP.7).

3. <u>Stringers:</u>

The stringers were in fair condition (SI&A 5).

- Typical: Large accumulation of delaminated rust along the entire length of the top face of the bottom flanges (Photo S.1).
- Typical: Rivets delaminated along bottom flange angles.
- Typical: Severe 1” thick pack rust between stringer bottom flange and seat angle at stringer-to-floorbeam connection. This detail may have been for construction purposes only (Photo S.2).
- Typical: Top flange cover plate knife edged between timber rail ties (Photo S.3).

- $S1_{N\_US}$: 1” diameter hole in web 1’-0” from bottom flange and 9” away from Floorbeam $F0_{N\_US}$.
- $S1_{N\_US}$: 5’-0” long severe delaminated rust accumulation along top of bottom flange due to moveable bridge components spanning between stringers (Photo S.4).
- $S1_{S\_DS}$: 1’-6” long x 3½” high hole at base of web above bottom flange angle (Photo S.5).
- $S1_{S\_DS}$: 10’-0” long severe knife edging resulting in 100% section loss along the east edge of bottom flange cover plate near midspan (Photos S.6 & S.7). Seventeen (17) rivets had excessive deterioration.
- $S1_{S\_DS}$ & $S2_{S\_DS}$: Severe pack rust accumulation atop bottom flange due to truss dead weight storage spanning between stringers (Photos S.8 & S.9).

4. Floorbeams:

The floorbeams were in satisfactory condition (SI&A 6).

- Typical delaminated rust accumulation along the top face of the bottom flanges.
- $F0_{S\_DS}$: One missing rivet in bottom flange angle adjacent to west stiffener (Photo FB.1).

5. Bottom Chord Cross Bracing:

The bottom chord cross bracing was in serious condition (SI&A 3).

- $L1_{US}$: Two (2) failed riveted connection at crossbrace-to-stringer support angle. One at each of $S1_{US}$ and $S2_{US}$ stringers. One (1) rivet through vertical leg deteriorated at midspan.
- $(L2\text{-}L3)_{US}$: The splice plate at the intersection with $L1_{US}$ was bowed due to severe pack rust.
- $L2_{US}$: Failed riveted connection at crossbrace-to-stringer support angle.
- $L4_{1\_US}$: Failed riveted connection at crossbrace-to-stringer support angle (Photo BX.1). Also, two (2) deteriorated rivets in horizontal leg to splice plate.
- $L4_{1\_US}$: 3’-0” long x full width of west angle severe delaminated rust with section loss adjacent to gusset plate at node $L2_{W\_US}$ (Photo BX.2).
- $(L5\text{-}L6)_{1\_US}$: The splice plate at the intersection with $L4_{1\_US}$ had severe pitting on both sides of $L4_{1\_US}$. There were also four (4) deteriorated rivets in the horizontal leg of $L6_{1\_US}$ at the splice.
- $L4_{2\_US}$: Failed riveted connection at crossbrace-to-stringer support angle.
- $L4_{2\_US}$: Severe delaminated rust 1’-0” long at node $L3_{NW\_US}$.
- $L5_{2\_US}$: Severe delaminated rust up to 100% section loss in horizontal leg 2’-0” from node $L2_{W\_US}$.
- $L7_{N\_US}$: Field welded repair to fix deteriorated rivet heads 5’-0” from gusset at node $L3B_{W\_US}$ (Photo BX.3).
- $L6_{1\_US}$: Failed riveted connection at crossbrace-to-stringer support angle (Photo BX.4).
- $L6_{1\_US}$: 3’-0” long x full width of bottom flange severe delaminated rust with section loss adjacent to gusset plate at node $L1_{W\_US}$ (Photo BX.5).
- $L6_{2\_US}$: 3’-0” long x 5” wide severe delaminated rust on west angle of brace at node $L2_{W\_US}$ (Photo BX.6).
- $L1_{DS}$: 1’-0” long x 3” wide severe knife edging and pitting in both legs of brace (Photos BX.7 & BX.8).

- $L2_{DS}$: 10” long x 3” wide section loss up to 100% in horizontal leg of brace (Photo BX.9).
- $L2_{DS}$: 1’-0” long x 3” wide section loss up to 100% in horizontal leg of brace at both sides of splice (Photo BX.10).
- $(L2\text{-}L3)_{DS}$: 2’-0” long severe section loss resulting in 1/8” remaining section in horizontal leg in the splice plate between $L2_{DS}$ and $L3_{DS}$ (Photo BX.11).
- $L6_{2\_DS}$: Several small holes in horizontal legs within a 1’-0” length x 10” width (full width) approximately 4’-0” from node $L3B_{W\_DS}$ (Photo BX.12). Severe pitting and five (5) popped rivet heads in the vertical leg at the same location (Photo BX.13).
- $L8_{DS}$: 6” long x 1½” wide ¼” section loss 1’-8” from the intersection with $L7_{DS}$.

6. Top Chord Cross Bracing:

The top chord cross bracing were in poor condition (SI&A 4).

- The top chord cross bracing consists of back-to-back angles for top and bottom flanges with a lattice bar web (Photos TX.1 & TX.2).
- Typical: Numerous areas of moderate to severe necking of the lattice bars at intersection with back-to-back flange angles (Photos TX.3 & TX.4).
- $T2_1$-$T3_1$: Top flange splice plate and bottom flange angles bowed at cross brace intersection due to pack rust between truss nodes U_1 and U_2 (Photos TX.5).
- $T2_2$-$T3_2$: Top flange splice bowed at cross brace intersection due to pack rust between truss nodes U_2 and $U_{3.}$

7. Portals:

The portals were in good condition (SI&A 7).

- No significant defects noted (Photos PT.1 through PT.4).
- Moderate to severe pack rust between bottom chord back-to-back angles was typical (Photos PT.5 & PT.6). The angles are bent in these locations (Photo PT.6).

8. Mechanical System Structural Components:

The mechanical system structural steel was in poor condition (SI&A 4).

- Several photos document how the mechanical system is connected to the truss (Photos ME.1 to ME.9).
- Several large holes in the brace plate between CG_{DS} and CG_{US} on the east side (Photo ME.2).
- CG_{US}: Majority of rivets on the north face, east side of bottom flange are deteriorated (Photo ME.10). Upto 4” of delaminated rust accumulation on bottom flange.
- Both stringers between PG and CG_{DS} have upto 100% section loss 1’-2” long x full width of bottom flange angle at CG_{DS} connection (Photo ME.11). Nine rivets on the west stringer have severe section loss.

9. **Fender System:**

The timber fender was in a failed condition (SI&A 0).

- The majority of the timber piles and whalers have decayed passed their useful life. Several areas of the fender system are completely missing particularly adjacent to the east and west sides of the center pier. See photos throughout other sections.
- The center pier and truss (in the open position) are not adequately protected against ship traffic.

10. **Abutments & Wingwalls:**

The abutments were in good condition (SI&A 7).

a. General Notes:

- The abutments and wingwalls will be reused as retaining walls for the new reinforced concrete abutments to be constructed behind them.
- No cracked or fractured noted.
- Mortar typically cracked and/or missing.
- The bottom two to three courses have missing mortar throughout. This can be attributed to the portion of the pier in the tidal zone.
- Minor efflorescence present at the mortar joints.
- Rust and grease staining present on faces below the superstructure.

b. West Abutment:

- General Notes typical (Photos WA.1 to WA.4).
- No misaligned or shifted stones noted.
- The footing was not visible from the waterline.

c. East Abutment:

- General Notes typical (Photos EA.1 to EA.4).
- The capstone at the fascia of each cheekwall has shifted due to vegetation growth in the joints. The integrity of the capstone has not been compromised.

11. **Retaining Wall:**

The retaining wall was in satisfactory condition (SI&A 6). (Photos RW.1 to RW.3)

a. General Notes:

- There were several areas of deteriorated concrete along the top cap.
  - 2’-0” long x 6” high spall at 98’-0” from the west end of the wall
  - 5’-0” long x 6” high spall at 182’
  - 9’-0” long x full height spall at 210’
  - 21’-0” long x full height spall at 219’
  - 30’-0” length x full height x full width severely spalled at 270’
- Spalled and delaminated concrete typically located at the vertical construction joints
  - 6” long x 4’-0” high at located 180’ from the west end of the wall
  - 3’-0” wide x 4’-6” high at 210’

    - 6” long x 2’-0” high at 240’ (Photo RW.5)
    - 2’-6” long x 2’-6” long at 270’
- The top cap has minor horizontal hairline cracks with efflorescence typically throughout. (RW.4)
- 15’-0” length of heavy efflorescence at 55’ from the west end of the wall
- 30’-0” length of moderate efflorescence between the joints located 240’ and 270’ from the west end of the wall (Photo RW.6).
    - 2’-0” long x 6” high spall at 314’
    - 2’-0” long x 6” high spall at 329’
- The deteriorated two strand steel railing atop the wall should be removed.
- Dense vegetation growth was obstructing portions of the wall.
- It appears the wall may be unreinforced due to the depth of the spalls beyond the typical location for reinforcement behind cover.

12. Piers:

The stone masonry piers were in good condition (SI&A 7).

a. General Notes:

- No cracked or fractured stones.
- Mortar typically cracked and/or missing.
- The bottom two to three courses have missing mortar throughout. This can be attributed to the portion of the pier in the tidal zone.
- Minor efflorescence present at the mortar joints.
- Rust and grease staining present on faces below the superstructure.

b. West Pier:

- General Notes typical (Photos WP.1 to WP.6).
- No misaligned or shifted stones noted.

c. Center Pier:

- General Notes typical (Photos CP.1 to CP.3).
- No misaligned or shifted stones noted.
- The mechanical systems for the swing bridge are connected to the top of the pier.

d. East Pier:

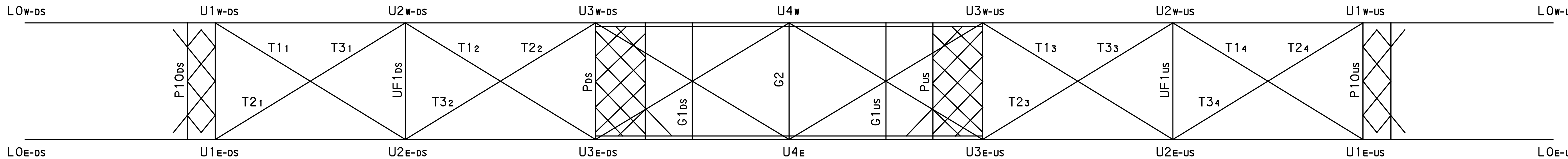
- General Notes typical (Photos EP.1 to EP.4).

- **Pedestal**
    - Two of the stones below the south wedge bearing shifted to the east 1” (Photo EP.5). Vegetation was present in the joints.

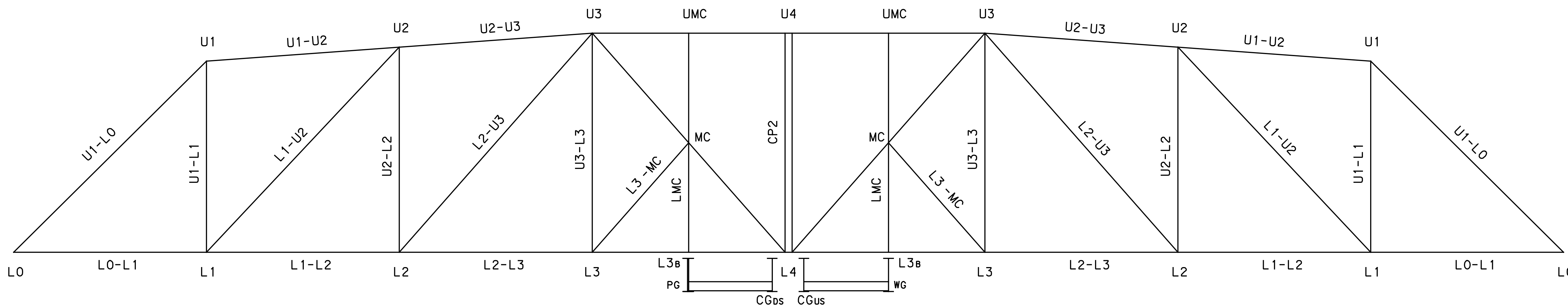
- **Capstone**
    - The two triangular end capstones shifted slightly due to vegetation growth in the joint (Photo EP.6).

INSPECTION REPORT
APPENDIX A

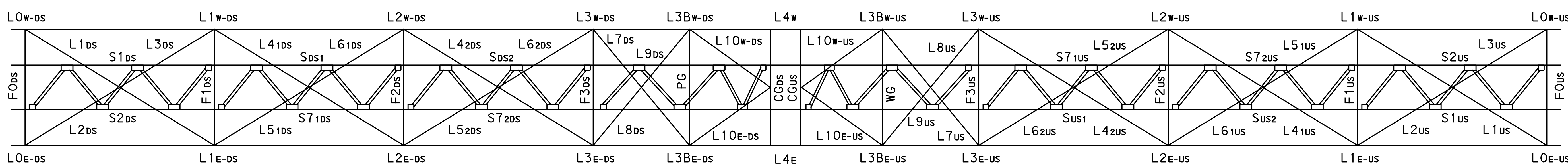
Figure 1: Truss Node Designations



TOP CHORD PLAN



ELEVATION



BOTTOM CHORD PLAN

LEGEND:

US - DENOTES UPSTREAM

DS - DENOTES DOWNSTREAM

SCHUYLKILL RIVER
DEVELOPMENT CORPORATION

PHILADELPHIA COUNTY

GRAYS FERRY AVENUE PEDESTRIAN TRAIL

FIGURE 1

DWG. NAME: Framing_Plan.dgn

TIME: 1:29:52 PM

DATE: 9/9/2011

H:\PA-CLIENTS\3061\3061-Reports\Inspection Report\Framing_Plan.dgn

INSPECTION REPORT
APPENDIX B

Inspection Photographs

GENERAL

PHOTO 1.1: East Elevation looking northwest.

1.1

File: DSC05176.JPG

PHOTO 1.2: West Elevation looking southeast.

1.2

File: img_1474.JPG

PHOTO 1.3: General view looking southwest.

1.3

File: img_1477.JPG

PHOTO 1.4: Looking south through truss.

1.4

File: DSC05111.JPG

PHOTO 1.5: General view of West Abutment and West Pier looking southwest.

1.5

File: DSC05144.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

TRUSS MEMBER LACING

PHOTO L.1: Typical severe necking adajcent to connection.

L.1

File: DSC05025.JPG

PHOTO L.2: Worst case deterioration leading to 100% section loss.

L.2

File: DSC05035.JPG

PHOTO L.3: Typical view of lacing bar with 100% section loss.

L.3

File: DSC05101.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

TRUSS MEMBER LACING

PHOTO L.4: Typical condition of a bowed lacing bar.

L.4

File: DSC05019.JPG

Truss Bottom Chords

PHOTO BC.1: $(L0\text{-}L1)_{W\_US}$: Moderate delaminated rust of top flanges at node $L1_{W\_US}$.

BC.1

File: DSC05151.JPG

PHOTO BC.2: $(L4\text{-}L3B)_{W\_US}$: Bottom tie-plate broken in half due to deterioration immediately north of gusset plate at node $L4_{W\_US}$.

BC.2

File: DSC05133.JPG

PHOTO BC.3: Same location at bottom chord shown in Photo BC.2.

BC.3

File: DSC05134.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chords

PHOTO BC.4: $(L3N\text{-}L3)_{W\_US}$: Top flange tie-plate had 100% section loss and severe delamination throughout adjacent to $L3_{W\_US}$.

BC.4

File: DSC05140.JPG

PHOTO BC.5: $(L3\text{-}L4)_{W\_DS}$: 2'-5" long x 5" high hole in the east channel web above the gusset plate at the south side of $L3B_{W\_DS}$.

BC.5

File: DSC05102.JPG

PHOTO BC.6: $(L3\text{-}L4)_{W\_DS}$: The bottom flange had severe deterioration and section loss at the same location as shown in Photo BC.5.

BC.6

File: DSC05103.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chords

PHOTO BC.7: $(L3\text{-}L4)_{W\_DS}$: Heavy pitting 1½” wide x 1’-3” high (full height) with a 1½” wide x 3” high hole in the west channel web immediately south of the gusset plate at node $L3B_{W\_DS}$.

BC.7

File: DSC05106.JPG

PHOTO BC.8: $(L3\text{-}L4)_{W\_DS}$: Three (3) broken lacing bars due to corrosion immediately south of the gusset plate a node $L3B_{W\_DS}$.

BC.8

File: DSC05101.JPG

PHOTO BC.9: $(L3\text{-}L4)_{W\_DS}$: Bottom tie-plate severe deterioration immediately south of node $L4_{W\_DS.}$

BC.9

File: DSC05136.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chords

PHOTO BC.10: (L3-L4)$_{E\_DS}$: 9” x 9” hole in west channel web at L3$_{E_DS}$.

BC.10

File: DSC05058.JPG

PHOTO BC.11: (L3-L4)$_{E\_DS}$: 2’-0” long x 8” high hole in the west channel web above the gusset plate at the south side of L3B$_{E_DS}$.

BC.11

File: DSC05059.JPG

PHOTO BC.12: Wider view of same defect shown in Photo BC.11.

BC.12

File: DSC05060.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chords

PHOTO BC.13: (L3-L4)$_{E\_DS}$: 2'-0" long x 6" high hole in the west channel web above the gusset plate at the north side of L3B$_{E_DS}$.

BC.13

File: DSC05061.JPG

PHOTO BC.14: (L3-L4)$_{E\_DS}$: 2"x2" hole in the web 2'-0" north of the hole at the gusset shown in Photo BC.13.

BC.14

File: DSC05062.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Splices

PHOTO SP.1: (L2-L3)$_{W\_US}$: Splice plates at L3$_{W_US}$ bowed along outside edge due to ½” pack rust.

SP.1

File: DSC05141.JPG

PHOTO SP.2: (L2-L3)$_{W\_DS}$: Splice plates at L3$_{W_DS}$ bowed along outside edge due to ½” pack rust. Top plate had a popped rivet head due to the stress created by the pack rust.

SP.2

File: DSC05099.JPG

PHOTO SP.3: (L0-L1)$_{E\_DS}$: Splice plates at L1$_{E_DS}$ bowed along the outside edges due to ¾” max pack rust.

SP.3

File: DSC05017.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Verticals

PHOTO 1.1: $(LM\text{-}MC)_{SW\_DS}$: 3" high x full width hole in the south flange of the west channel at the base of the vertical at LM_{SW}.

V1.1

File: DSC05107.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Gusset Plates

PHOTO GPC.1: Typical: Planks held moisture against the gussets.

GP.1

File: DSC05043.JPG

PHOTO GP.2: $L0_{W\_US}$: Delaminated rust, including ten (10) rivets, along the bottom 6" height of the east vertical gusset plate connecting the bottom and diagonal chords.

GP.2

File: DSC05153.JPG

PHOTO GP.3: $L1_{W\_US}$: Large accumulation of delaminated rust atop the gusset plate at southeast corner adjacent to crossbrace.

GP.3

File: DSC05152.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Gusset Plates

PHOTO GP.4: $L2_{W\_US}$: Large accumulation of delaminated rust atop gusset plate at southeast and northeast corners adjacent to crossbrace.

GP.4

File: DSC05123.JPG

PHOTO GP.5: $L3_{W\_US}$: 100% section loss 1'-6" wide x 4" long on the south edge and 1'-0" long x 4" wide on the southeast edge.

GP.5

File: DSC05139.JPG

PHOTO GP.6: $L3B_{W\_US}$: Severe delaminated rust with 100% section loss 1'-0" long x full width of bottom chord at the north and south edges.

GP.6

File: DSC05135.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Gusset Plates

PHOTO GP.7: $L4_W$: Severe pitting and corroded rivets throughout plate. Two 3”x3” holes at the top of the plate. Timbers were resting at the location of the holes indicating trapped moisture led to the deterioration.

GP.7

File: DSC05132.JPG

PHOTO GP.8: $L2_{W\_DS}$: Popped rivet due to 1” thick pack rust between gusset plate and bottom chord.

GP.8

File: DSC05100.JPG

PHOTO GP.9: $L3B_{W\_DS}$: Severe delaminated rust at south end 1’-0” long x 2’-0” wide. 7” long x 9” wide hole at the edge of the gusset adjacent to the chord.

GP.9

File: DSC05103.JPG

Truss Bottom Chord Gusset Plates

PHOTO GP.10: L3B$_{E_US}$: 6”x6” hole at the south end of the gusset below the chord.

GP.10

File: DSC05084.JPG

PHOTO GP.11: L3B$_{E_US}$: 2’-0” long x 1’-2” wide severe delaminated rust with section loss below the chord at the north end of the gusset. 3” long x 9” wide area at north end below a wooden timber support. 6”x6” delaminated area at northwest corner; slightly bent due to ½” pack rust.

GP.11

File: DSC05116.JPG

PHOTO GP.12: L4$_{E}$: Several holes through the vertical gusset plate.

GP.12

File: DSC05129.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Gusset Plates

PHOTO GP.13: Closeup of defect in Photo GP.12.

GP.13

File: DSC05075.JPG

PHOTO GP.14: $L1_{E\_DS}$: Delaminated rust at north end 1'-0" long x 2'-6" wide (full width). Included within this area was a 4" long x 9" wide and 2" long x 6" wide severely delaminated area upto 100% section loss.

GP.14

File: DSC05049.JPG

PHOTO GP.15: $L3_{E\_DS}$: Severe delaminated rust with section loss at north end 1'-0" long x 1'-0" wide.

GP.15

File: DSC05057.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Stringers

PHOTO S.1: Typical: Large accumulation of delaminated rust along the entire length of the top face of the bottom flanges.

S.1

File: DSC05053.JPG

PHOTO S.2: Typical: Severe 1" thick pack rust between stringer bottom flange and seat angle at stringer-to-floorbeam connection. This detail may have been for construction purposes only.

S.2

File: DSC05044.JPG

PHOTO S.3: Typical: Top flange cover plate knife edged between timber rail ties.

S.3

File: DSC05051.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Stringers

PHOTO S.4: $S1_{N\_US}$: 5’-0” long severe delaminated rust accumulation along top of bottom flange due to moveable bridge complonents spanning between stringers.

S.4

File: DSC05154.JPG

PHOTO S.5: $S1_{S\_DS}$: 1’-6” long x 3½” high hole at base of web above bottom flange angle.

S.5

File: DSC05088.JPG

PHOTO S.6: $S1_{S\_DS}$: 10’-0” long severe knife edging resulting in 100% section loss along the east edge of bottom flange cover plate near midspan.

S.6

File: DSC05094.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Stringers

PHOTO S.7: Same defect as noted in Photo S.6.

S.7

File: DSC05095.JPG

PHOTO S.8: $S1_{S\_DS}$ & $S2_{S\_DS}$: Severe pack rust accumulation atop bottom flange due to truss dead weight storage spanning between stringers.

S.8

File: DSC05047.JPG

PHOTO S.9: Same defect and location as noted in Photo S.8. $S2_{S\_DS}$ Shown.

S.9

File: DSC05093.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Floorbeam

PHOTO FB.1: $F0_{DS}$: One missing rivet in bottom flange angle adjacent to west stiffener.

FB.1

File: DSC05086.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Crossbraces

PHOTO BX.1: $L4_{1\_US}$: Failed riveted connection at crossbrace-to-stringer support angle.

BX.1

File: DSC05127.JPG

PHOTO BX.2: $L4_{1\_US}$: 3'-0" long x full width of west angle severe delaminated rust with section loss adjacent to gusset plate at node $L2_{W\_US}$.

BX.2

File: DSC05145.JPG

PHOTO BX.3: $L7_{US}$: Field welded repair to fix deteriorated rivet heads 5'-0" from gusset at node $L3B_{W\_US}$.

BX.3

File: DSC05126.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Crossbraces

PHOTO BX.4: $L6_{1\_US}$: Failed riveted connection at crossbrace-to-stringer support angle.

BX.4

File: DSC05147.JPG

PHOTO BX.5: $L6_{1\_US}$: 3'-0" long x full width of bottom flange severe delaminated rust with section loss adjacent to gusset plate at node $L1_{W\_US}$.

BX.5

File: DSC05148.JPG

PHOTO BX.6: $L6_{2\_US}$: 3'-0" long x 5" wide severe delaminated rust on west angle of brace at node $L2_{W\_US}$.

BX.6

File: DSC05143.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Crossbraces

PHOTO BX.7: $L1_{DS}$, $L2_{DS}$, $L3_{DS}$: Defects in crossbracing and Stringer S1S. See Photos BX.8 through BX.11 for closer views.

BX.7

File: DSC05092.JPG

PHOTO BX.8: $L1_{DS}$: 1'-0" long x 3" wide severe knife edging and pitting in both legs of brace.

BX.8

File: DSC05092.JPG

PHOTO BX.9: $L2_{DS}$: 10" long x 3" wide section loss up to 100% in horizontal leg of brace.

BX.9

File: DSC05089.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Crossbraces

PHOTO BX.10: $L2_{DS}$: 1'-0" long x 3" wide section loss up to 100% in horizontal leg of brace at both sides of splice. Also see Photo BX.8. Also see Photo BX.8.

BX.10

File: DSC05090.JPG

PHOTO BX.11: $(L2\text{-}L3)_{DS}$: 2'-0" long severe section loss resulting in 1/8" remaining section in horizontal leg in the splice plate between $L2_{DS}$ and $L3_{DS}$. Also see Photo BX.8.

BX.11

File: DSC05091.JPG

PHOTO BX.12: $L6_{2\_DS}$: Several small holes in horizontal legs within a 1'-0" length x 10" width (full width) approximately 4'-0" from node $L3B_{W\_DS.}$

BX.12

File: DSC05104.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Bottom Chord Crossbraces

PHOTO BX.13: $L6_{2\_DS}$: Severe pitting and five (5) popped rivet heads in the vertical leg at the same location as defect in Photo BX.12.

BX.13

File: DSC05105.JPG

Truss Top Chord Crossbraces

PHOTO TX.1: The top chord cross bracing consists of back-to-back angles for top and bottom flanges with a lattice bar web. Looking south at south end of truss.

TX.1

File: DSC05026.JPG

PHOTO TX.2: Looking north from same location as Photo TX.1.

TX.2

File: DSC05032.JPG

PHOTO TX.3: Typical: numerous areas of moderate to severe necking of the lattice bars at intersection with back-to-back angles. See Photo TX.4 for a closer view.

TX.3

File: DSC0538.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Top Chord Crossbraces

PHOTO TX.4: Typical: numerous areas of moderate to severe necking of the lattice bars at intersection with back-to-back flange angles.

TX.4

File: DSC05028.JPG

PHOTO TX.5: $T2_1$-$T3_1$: Top flange splice plate and bottom flange angles bowed at cross brace intersection due to pack rust between truss nodes U_1 and U_2.

TX.5

File: DSC05034.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Portals

PHOTO PT.1: Typical view of portal at node U_{1_DS}.

PT.1

File: DSC05036.JPG

PHOTO PT.2: Typical view of portal between U_{3_US} and $U3B_{US}$.

PT.2

File: DSC05038.JPG

PHOTO PT.3: Typical view of portal at node U_{3_US}.

PT.3

File: DSC5112.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

Truss Portals

PHOTO PT.4: Typical view of portal girder at node U4.

PT.4

File: DSC05110.JPG

PHOTO PT.5: Typical: Moderate to severe pack rust between bottom chord back-to-back angles. See Photo PT.6 for closer view.

PT.5

File: DSC05071.JPG

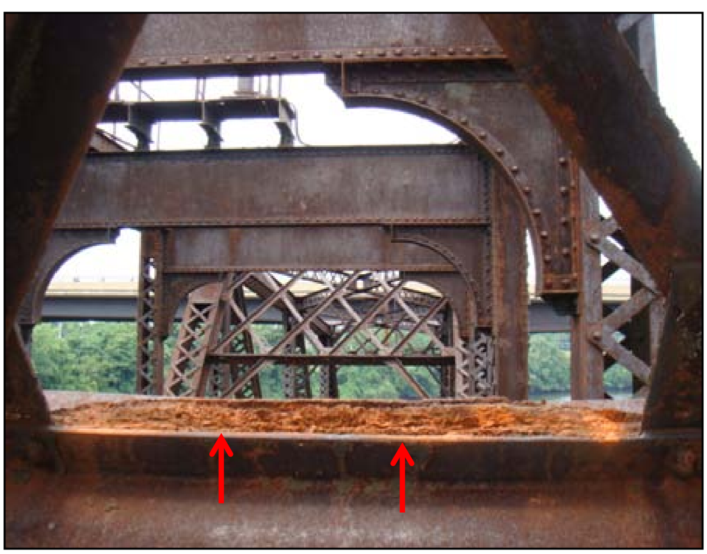


PHOTO PT.6: Closer view of defect noted in PT.5. Note the angles are bent due to the pack rust.

PT.6

File: DSC05070.JPG

PHOTO ME.1: Looking southwest at the mechanical system at the center pier.

ME.1

File: DSC05129.JPG

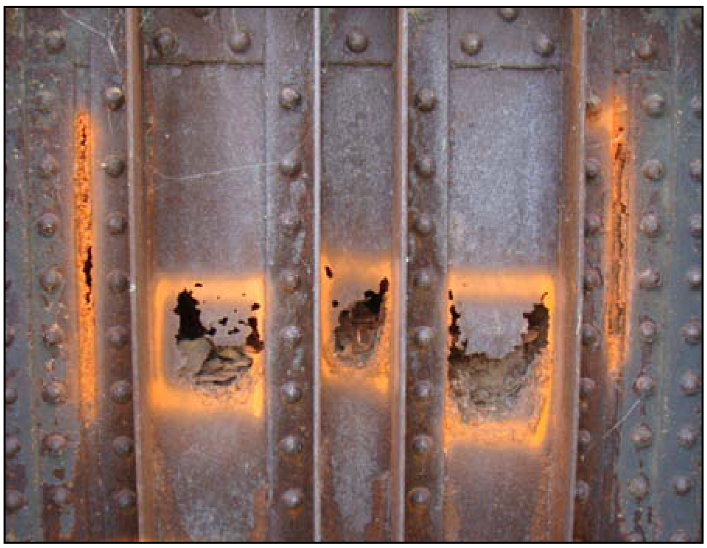


PHOTO ME.2: 100% section loss in the brace between the center girders. Closeup view of defect shown in Photo ME.1.

ME.2

File: DSC05075.JPG

PHOTO ME.3: General view looking north at Girder CG_{DS}.

ME.3

File: DSC05052.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

MECHANICAL

PHOTO ME.4: General view looking southwest at Girder CG_{US}.

ME.4

File: DSC05080.JPG

PHOTO ME.5: General view looking north at Girder WG

ME.5

File: DSC05067.JPG

PHOTO ME.6: General view of wheel bearing.

ME.6

File: DSC05082.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

MECHANICAL

PHOTO ME.7: General view of gear between both center girders (CG).

ME.7

File: DSC05056.JPG

PHOTO ME.8: General view of wedge motor cantilevered from west side of bridge near the center pier.

ME.8

File: DSC05114.JPG

PHOTO ME.9: General view of wedge bearing at end of truss.

ME.9

File: DSC05014.JPG

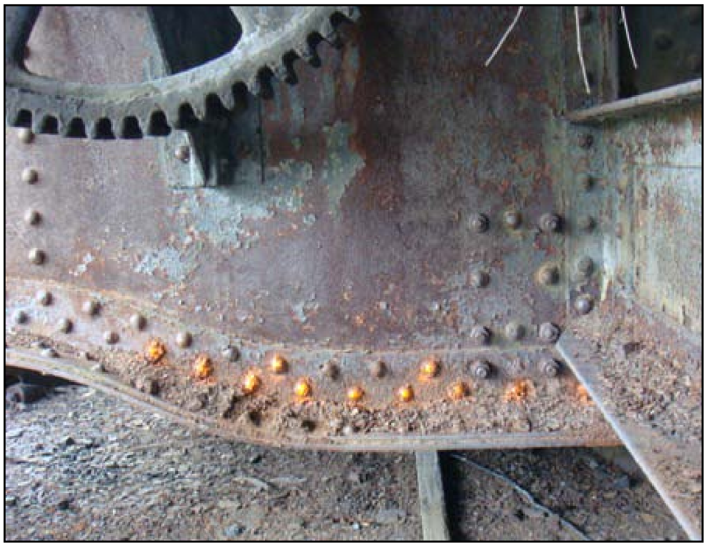


PHOTO ME.10: CG_{US}: Majority of rivets on the north face, east side of bottom flange are deteriorated.

ME.10

File: DSC05078.JPG

PHOTO ME.11: Both stringers between PG and CG_{DS} have upto 100% section loss 1'-2" long x full width of bottom flange angle at CG_{DS} connection

ME.11

File: DSC05064.JPG

WEST ABUTMENT

PHOTO WA.1: East Elevation looking northwest.

WA.1

File: DSC05165.JPG

PHOTO WA.2: West Elevation looking southeast.

WA.2

File: DSC05168.JPG

PHOTO WA.3: General view looking southwest.

WA.3

File: DSC05170.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

WEST ABUTMENT

PHOTO WA.4: Looking south through truss.

WA.4

File: DSC05169.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

EAST ABUTMENT

PHOTO EA.1: Looking east at the East Abutment. The East Pier is in the foreground.

EA.1

File: DSC05073.JPG

PHOTO EA.2: Schuylkill Banks Trail adjacent to the East Abutment.

EA.2

File: DSC05013.JPG

PHOTO EA.3: General view of south cheekwall. See Photo EA.4 for close-up view.

EA.3

File: DSC05007.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

EAST ABUTMENT

PHOTO EA.4: Close-up view of capstone on south cheekwall. The capstone has shifted due vegetation in the joint.

EA.4

File: DSC05006.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

RETAINING WALL

PHOTO RW.1: Looking east along path at midlength of wall.

RW.1

File: DSC04999.JPG

PHOTO RW.2: Looking south at retaining wall.

RW.2

File: DSC05000.JPG

PHOTO RW.3: Looking west along path at retaining wall.

RW.3

File: DSC04998.JPG

PHOTO RW.4: Typical horizontal cracks with efflorescence throughout cap.

RW.4

File: DSC04985.JPG

PHOTO RW.5: Typical spall at a vertical construction joint. Location show 240' from west end of wall.

RW.5

File: DSC04991.JPG

PHOTO RW.6: Moderate efflorescence located 55' from west end of the wall.

RW.6

File: DSC04992.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

WEST PIER

PHOTO WP.1: West Elevation looking east.

WP.1

File: DSC05173.JPG

PHOTO WP.2: East Elevation looking southwest.

WP.2

File: DSC05144.JPG

PHOTO WP.3: General view of wedge bearings.

WP.3

File: DSC05157.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

WEST PIER

PHOTO WP.4: Looking south at wedge bearing pedestal.

WP.4

File: DSC05158.JPG

PHOTO WP.5: Looking east at approach span bearings.

WP.5

File: DSC05162.JPG

PHOTO WP.6: Close up view showing overall good condition of masonry.

WP.6

File: DSC05161.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

CENTER PIER

PHOTO CP.1: East Elevation looking west.

CP.1

File: DSC05181.JPG

PHOTO CP.2: South Elevation looking north.

CP.2

File: DSC05050.JPG

PHOTO CP.3: General view looking southwest.

CP.3

File: DSC05052.JPG

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

EAST PIER

PHOTO EP.1: West Elevation looking east.

EP.1

File: DSC05130.JPG

PHOTO EP.2: East Elevation looking west.

EP.2

File: DSC05008.JPG

PHOTO EP.3: General view looking west at south nose.

EP.3

File: DSC05009.JPG

AMMANN & WHITNEY

PHOTOGRAPHS

INSPECTION REPORT
Grays Ferry Pedestrian Bridge over Schuylkill River
Concept Design Services

EAST PIER

PHOTO EP.4: Looking at wedge bearings.

EP.4

File: DSC05178.JPG

PHOTO EP.5: Two stones below south wedge bearing shifted. Vegetation present in the joints.

EP.5

File: DSC05179.JPG

PHOTO EP.6: Triangular piece of capstone at south end shifted due to vegetation growth in joint.

EP.6

File: DSC05177.JPG